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A NATURAL HISTORY OF THE

# BRITISH BUTTERFLIES

THEIR WORLD-WIDE VARIATION AND GEOGRAPHICAL  
DISTRIBUTION.

*A TEXT-BOOK FOR STUDENTS AND COLLECTORS.*

BY

*James William* (THE LATE)  
J. W. TUTT, F.E.S.

Author of "A Natural History of the British Lepidoptera,"  
"The British Noctuae and their Varieties," "Monograph of the British  
Pterophorina," "British Butterflies," "British Moths," "Migration and  
Dispersal of Insects," "Melanism and Melanochroism in Lepidoptera,"  
"Practical Hints for the Field Lepidopterist," etc.

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(Edited by the REV. GEORGE WHEELER, M.A., F.Z.S., F.E.S.,  
Vice-president and Hon. Secretary of the Entomological Society of London.)

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## EDITOR'S PREFACE.

The length of time which has elapsed before the completion of the present volume needs at least explanation if not apology. It also seems incumbent upon me to state exactly to what extent I am responsible for the contents of the last half of it, and I believe both results will be best attained by giving a short sketch of the circumstances under which it was undertaken and carried out.

Some ten months after the death of Mr. Tutt, I was officially requested on behalf of his executors to undertake the completion of the current volume, a task which I consented to carry out (solely as a labour of love) on the one condition that I should not be hurried, as it was only in the leisure of what was then a busy, and has since become a much busier life, that I could find time to give to the undertaking. This condition having been accepted, the author's notes were delivered into my keeping in four large envelopes, and on opening them I was simply appalled by the task that lay before me. They were filled with pieces of paper of all sorts and sizes, each containing one or more notes (if more than one, generally on points quite unconnected with each other except as to species); then there were long extracts, made by Mr. Stanley Edwards, from writers in various languages; skeletons of synonymy; a few local lists; the beginnings of paragraphs on various subjects rarely consisting of a dozen consecutive lines; tiny slips containing a single magazine reference, no subject being specified; small items of information in handwriting quite unknown to me, but the authors of which had to be discovered so that their names might be put in brackets after the extract; in one case only a whole long paragraph,—and this I am sure Mr. Tutt would not have published in its present form had he lived; only one thing complete, *viz.*, Dr. Chapman's magnificent life-history of the earlier stages of *Aricia medon*:—all this, which Mr. Tutt, with his marvellous memory, would have quickly reduced to order, was to me a hopeless chaos by which I was for some time simply bewildered, and with which I could at first make no progress worth mentioning. I felt bound to use, if possible, everything which the author had written, and as this, as often as not, consisted of sentences without a beginning, or without an end, or indeed without either, it was necessary for me to adopt his style, his punctuation, and as far as possible his mannerisms, as well as his opinions, however strongly opposed to my own. Add to this the fact that I have personally checked every reference at which I could possibly get, and that delays, sometimes long delays, occurred between the posting of MS. and the arrival of proof, and I think the length of time which it has taken to complete the volume is sufficiently accounted for.

In one point only I have departed from the author's invariable custom, *viz.*, in the omission of a British locality list for *Polyommatus icarus*; Mr. Tutt would, I know, have given one, for parts of it existed, but the delay which would have been caused in bringing out part xi., the first for which I was responsible, would have been so great, in consequence of the time required for compiling such a list, and its utility, when made, was so problematical, that I thought it better to



embody the information to hand in the section on "Times of Appearance," and to omit the locality list altogether. I hope I was justified in so doing.

With the exception of the first page or so on the habits of the perfect insect, I found myself obliged to write the whole of the account of *Aricia medon*, of course excepting Dr. Chapman's Life-History, but I availed myself as largely as possible of direct quotation, and no opinion of my own is expressed, either here or elsewhere, unless I have given my name or initials at the end; every other opinion expressed is that of the original author; and I am most anxious to emphasize this fact, both in order that he may get all the credit due for them, and also to protect myself against having them quoted or referred to as my own, which is by no means always the case. For instance, had I been writing in my own name, I should never have permitted such an expression as *Lycaena arion* ab. *alcon*, and should certainly have used le Chamberlain's name *pseudo-alcon* to replace it, since there is already a species of *Lycaena* so named. Again, I have no personal objection to the expression "sub-species," though I am entirely at one with the objections made to Frühstorfer's misuse of the same.

Much larger extracts were already written by the author in the case of *Lycaena arion*, though there was only one section quite complete, but even in the case of this species I have had to work out and write the whole section on Variation (pp. 304-328), as well as considerable portions of other sections, but it was not necessary in this instance to make so elaborate a mosaic of my own words and the original author's as was the case with the previous species. The life-history here again will be recognized as Dr. Chapman's. Most of the lists of localities, variation, etc., were sent to Mr. Tutt, and have been acknowledged by him, such as the elaborate list of German localities and habitats supplied by Herr Gillmer, the *P. icarus* variation of the late Dr. Hodgson, the variation of *A. medon* in Switzerland of Dr. Reverdin, etc., as well as short lists too numerous to mention, but the French local lists sent by Mr. H. Rowland-Brown, the Chiltern variation of *A. medon* by Mr. B. C. S. Warren, and the information from Turkey with regard to *L. arion* by Mr. P. P. Graves, have been supplied to me direct, and I here acknowledge my debt and record my thanks. Mr. Stanley Edwards has also given much kind help in the wearisome work of searching in magazines, which has saved me a great deal of time and labour, though I have not considered myself absolved thereby from the duty of checking these references, as well as those in other parts of the work. Of Dr. Chapman's large share of the work it is superfluous to speak. The laborious and somewhat thankless task of preparing the Synopsis and Index has been carried out by Mr. H. J. Turner.

A word of explanation is necessary with regard to the numbering of the Plates, since otherwise many subscribers would naturally suppose that some had been lost. This is not the case. Plates iii., xii., xx. and xxix. simply do not exist. What Plate iii. was to have represented I have no idea; Plate xiii. was also published before the numbering of the plates came into my hands, but I have no doubt that Mr. Tutt intended to have two plates of the imago of *P. icarus*, for which however there was not sufficient material forthcoming; hence Plate xi. is followed by Plate xiii. The other Plates I was obliged to number

before I found that there was no material for illustrating the imagines of *A. medon* and *L. arion*, for which the numbers xx. and xxix. had been left respectively. The volume is, however, illustrated by forty-one plates, which, without attempting to vie with the number in the previous volume, is largely in excess of those appearing in preceding ones.

It had been hoped also to deal with *Hamearis lucina* in this volume, but the notes left by Mr. Tutt on this species were insufficient to give his views on this group, and had they been otherwise the volume would have been swollen beyond due proportions. It was therefore necessary to be content to leave off at the end of the *Lycaenidae*.

In conclusion I cannot refrain from recurring to the fact that the difficulty of finishing a work by J. W. Tutt is necessarily enormous, and can hardly do better than quote Aaron Hill, the author of the libretto of Handel's opera *Rinaldo*, in his appeal to the "Indulgent Reader," when he says "Let this Work therefore satisfy you, and, if not deserving of your Praise, do not withhold at least your Compassion."

GEORGE WHEELER.

37, Gloucester Place, W.,

May 28th, 1914.

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#### NOTE.

The late Mr. J. W. Tutt's Executors (Messrs. Herbert E. Page, George Robinson and Henry Smetham), charged under the terms of his Will to complete this volume, deeply welcome its conclusion. They cannot appreciate too highly the able and affectionate labours of the Reverend George Wheeler and his band of willing helpers. Of the scope of the work and the complications of its material some conception may be gathered from Mr. Wheeler's own words. The extent of those labours can only be known to Mr. Wheeler himself. The scientific knowledge requisite for such a task carries its own evidence in its pages. The Executors cannot let the publication pass without expressing their warmest acknowledgments of a labour so affectionate and so capably and satisfactorily completed.



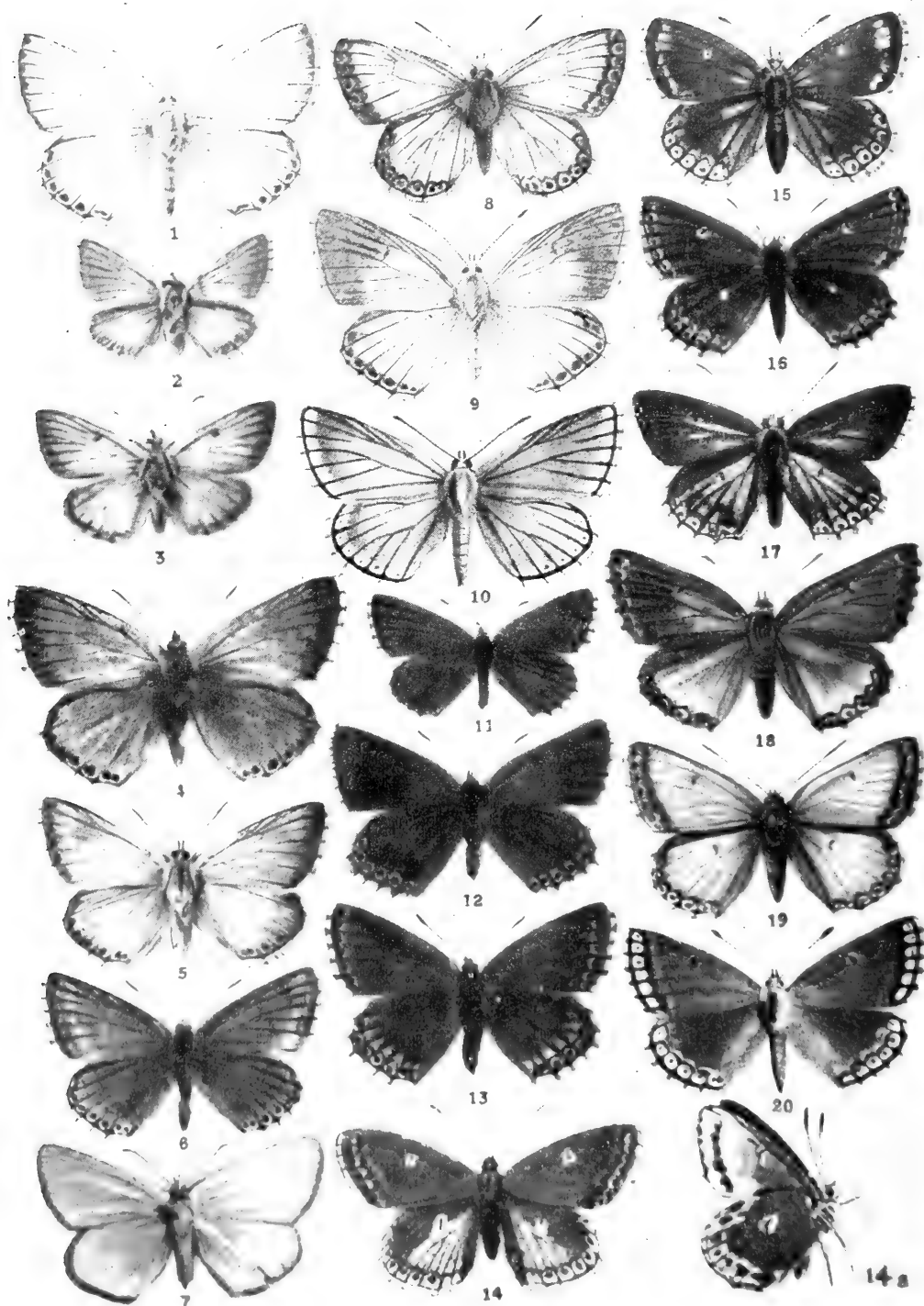
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FIG. 1.—*A. HYBR. POLONUS*, ZELL. FIGS. 2-10.—*A. CORIDON*, ♂.

FIGS. 11-20.—*A. CORIDON*, ♀.

EXPLANATION OF PLATE I.  
(To be bound facing Plate I.).

Fig. 1.—*AGRIADES* *hybr. POLONUS*, Zell.

MALE ABERRATIONS OF *AGRIADES* *CORIDON*.

- Fig. 2.—*AGRIADES* *CORIDON* *ab. MINUTISSIMUS*, Tutt.  
Fig. 3.—*AGRIADES* *CORIDON* *ab. MINOR*, Ckll., showing also the characters of *ab. TORGNIENSIS*, Hav., and *ab. ALBOFIMBRIATA*, Tutt.  
Fig. 4.—*AGRIADES* *CORIDON* *ab. SUBSUFFUSA*, Tutt.  
Fig. 5.—*AGRIADES* *CORIDON* *ab. ANGUSTIMARGO*, Tutt.  
Fig. 6.—*AGRIADES* *CORIDON* *ab. SUFFUSA*, Tutt.  
Fig. 7.—*AGRIADES* *CORIDON* *ab. LACTICOLOR*, Pearce.  
Fig. 8.—*AGRIADES* *CORIDON* *ab. PUNCTATA*, Tutt.  
Fig. 9.—*AGRIADES* *CORIDON* *ab. MARGINATA*, Tutt.  
Fig. 10.—*AGRIADES* *CORIDON* *ab. FOWLERI*, South.

FEMALE ABERRATIONS OF *AGRIADES* *CORIDON*.

- Fig. 11.—*AGRIADES* *CORIDON* *ab. MINOR*, Ckll., showing also the characters of *ab. UNICOLOR*, Tutt.  
Fig. 12.—*AGRIADES* *CORIDON* *ab. SUBAURANTIA*, Tutt.  
Fig. 13.—*AGRIADES* *CORIDON* *ab. CAERULEOCUNEATA*, Tutt.  
Fig. 14.—*AGRIADES* *CINNUS*, Hb., also showing the characters of *ab. SUBRADIOSA*, Tutt, and *ab. ALBIPUNCTA*, Tutt.  
Fig. 14A.—Underside of fig. 14=*ab. CORYDONIS*, Bergstr. (= *CINNUS*, Hb.).  
Fig. 15.—*AGRIADES* *CORIDON* *ab. RADIOALBOLUNULATA*, Tutt, also showing the characters of *ab. ALBICINCTA*, Tutt.  
Fig. 16.—*AGRIADES* *CORIDON* *ab. ALBOLUNULATA*, Tutt, also showing the characters of *ab. ALBIPUNCTA*, Tutt.  
Fig. 17.—*AGRIADES* *CORIDON* *ab. RADIOSUBAURANTIA*, Tutt.  
Fig. 18.—*AGRIADES* *CORIDON* *ab. SEMISYNGRAPHA-PERAURANTIA*, Tutt.  
Fig. 19.—*AGRIADES* *CORIDON* *ab. AUROTITHONUS*, Tutt.  
Fig. 20.—*AGRIADES* *CORIDON* *ab. FOWLERI*, South.

Figs. 14 and 14a are copies of Hübner's original figures of *cinnus* (Eur. Schmett., pl. 167, figs. 830-831) = *corydonis*, Bergstr. (a much older name).

Fig. 18 is reproduced badly and does not show clearly the almost uniform layer of blue on the hindwings.



# BRITISH BUTTERFLIES.

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## Superfamily II: RURALIDES.

Family: RURALIDÆ.

Subfamily: LYCÆNINÆ.

Tribe: PLEBEIDI.

Genus: AGRIADES.

AGRIADES CORIDON, Poda.

SYNONYMY.—Species: **Coridon**, Poda, "Ins. Mus. Græc.," pp. 77, 78 (1761); Scop., "Ent. Carn.," p. 179 (1763); v. Rott., "Naturf.," vi., p. 25 (1775); Esp., "Schmett. Eur.," pl. xxxiii. (supp. ix.), fig. 4 (1777); i., pt. 1, p. 335 (1779); Göze, "Ent. Beit.," iii., pt. 2, p. 67 (1780); Schneid., "Sys. Besch.," p. 242 (1787); Lang, "Verz.," p. 53 (1789); Scriba, "Journ.," p. 211 (1791); Herbst, "Nat. Syst. Ins.," xi., p. 213, pl. 313, figs. 1-3 (1804); Evers., "Faun. Volg.-Ural.," p. 50 (1844); Staud., "Cat.," 2nd ed., p. 12 (1871); Cuni-y-Mart., "Lep. Barc.," p. 18 (1874); Weiler, "Schmett. Innsb.," p. 9 (1877); Peyerim., "Lép. Als.," p. 24 (1880); Jourdh., "Lép. Aube," p. 18 (1883); Rühl, "Pal. Gr.-Schmett.," pp. 276, 763 (1892-5); Grote, "Schmett. Hildesh.," p. 42 (1897); Staud., "Cat.," 3rd ed., p. 86 (1901); Fleck, "Macr.-Lep. Rumän.," p. 21 (1901); Lamb., "Pap. Belg.," p. 238 (1902); Tutt, "Ent. Rec.," xxi., p. 108 (1909); Seitz, "Gross-Schmett.," i., p. 315 (1909). **Corydon**, Schiff., "Schmett. Wien," p. 184 (1775); Harris, "Eng. Lep.," p. 2 (1775); Bergstr., "Nom.," iii., p. 3, pl. xlix., figs. 1, 2 (1780); Fab., "Mant. Ins.," ii., p. 74 (1787); Bkh., "Sys. Besch.," i., pp. 158, 277 (1788); ii., p. 227 (1789); de Vill., "Car. Linn. Ent. F. Suec.," ii., p. 75 (1789); Rossi, "Mant.," ii., p. 12 (1792); Fab., "Ent. Syst.," iii., pt. 1, p. 298 (1793); Bkh., "Rhein. Mag.," p. 286 (1793); Lewin, "Ins. Gt. Brit.," p. 76, pl. xxxvi., figs. 1-3 (1795); Hübn., "Eur. Schmett.," pl. lix., figs. 286-8 (1795); Don., "Brit. Ins.," vii., p. 53, pl. 236, figs. 1, 1a (1798); Hübn., "Raupen.," i., pl. xxxvii., Pap. ii., Gens Aa., figs. 1a-c (*circ.* 1800); Ill., "Schmett. Wien," 2nd ed., ii., p. 269 (1801); Schrank, "Faun. Boica.," ii., pt. 1, p. 212 (1801); Haw., "Lep. Brit.," p. 43 (1803); Hffmsgg., "Ill. Mag.," iii., p. 190 (1803); Lasp., "Ill. Mag.," iv., p. 63 (1804); Panz., "Schäff. Icon. Ins.," p. 182 (1804); Latr., "Nat. Hist. Crust.," xiv., p. 119 pl. cvii., figs. 1, 2 (1805); Ochs., "Schmett. Sachs.," p. 318 (1805); Hübn., "Eur. Schmett.," text, p. 47 (*circ.* 1805); Fab., "Ill. Mag.," vi., p. 286 (1807); Ochs., "Die Schmett.," i., pt. 2, p. 28 (1808); Latr., "Gen. Crust. Ins.," iv., p. 207 (1809); Oken, "Lehrb.," ii., p. 719 (1815); Leach, "Edin. Enc.," ix., pt. i., p. 129 (1815); Ochs., "Die Schmett.," iv., p. 25 (1816); Hübn., "Verz.," p. 68 (1816-18); Godt., "Ency. Méth.," ix., p. 693 (1819); Sam., "Ent. Comp.," p. 241 (1819); Godt., "Pap. Fr.," i., p. 208, pl. xi. *sec.*, fig. 1, xi. *tert.*, fig. 1 (1821); Curt., "Brit. Ent.," fo. 5 (1824); Stphs., "Illus. Haust.," i., p. 88 (1828); "Ins. Cat.," 1st ed., p. 23 (1829); Bdv., "Eur. Lep. Ind.," p. 12 (1829); Meig., "Eur. Schmett.," ii., p. 19, pl. xlvii., figs. 1a-d (1830); Koll., "Verz.," p. 8 (1832); Bdv., "Icon. Chen.," pl. ii., figs. 1-3 (1832); Dup., "Pap. Fr.," supp. i., p. 389 (1832); Cant., "Lép. Var.," p. 6 (1833); Treits., "Die Schmett.," supp. x., pt. 1, p. 235 (1834); Nick., "Böhm. Tagf.," p. 14 (1837); Freyer, "Neu. Beitr.," iii.,



p. 45, pl. 223, fig. 1 (1839); Ramb., "Faun. And.," p. 273 (1839); Wood, "Ind. Ent.," p. 8, pl. ii., fig. 65 (1839); Bdv., "Gen. et Ind. Meth.," p. 12 (1840); Humph. and Westd., "Brit. Butts.," p. 105, pl. xxxiii., figs. 4-8 (1841); Neüst. and Korn., "Schmett. Schles.," p. 46, pl. 21, figs. 69a-f (1842); Hch.-Sch., "Sys. Bearb.," i., p. 121 (1843); Dup., "Cat. Meth.," p. 33 (1845); Dbldy., "Syn. List," 1st ed., p. 1 (1850); Stphs., "List," 1st ed., p. 19 (1850); Meyer-Dür., "Schmett. Schweiz.," p. 85 (1851); Hdnrch., "Lep. Eur. Cat. Meth.," p. 14 (1851); Hch.-Sch., "Sys. Bearb.," vi. supp., p. 27; Ind. Alph. to vol. i., p. 7 (1852); Westd. and Hew., "Gen. Diurn. Lep.," ii., p. 493 (1852); Led., "Verh. zool.-bot. Gesell.," ii., p. 20 (1852); Gerh., "Mon.," p. 17, pl. 31, figs. 2a-c (1853); Koch, "Geog. Verb.," p. 49 (1854); "Schmett. Deutsch.," p. 29 (1856); Stphs., "List," 2nd ed., p. 18 (1856); Stn., "Man.," i., p. 60 (1857); Ramb., "Cat. Léop. And.," p. 42 (1858); Speyer, "Geog. Verb.," i., pp. 19, 85 (1858); Dbldy., "Syn. List," 2nd ed., p. 2 (1859); Hein., "Schmett. Deutsch.," i., p. 79 (1859); Now., "Enum. Lep.," p. 9 (1860); Zebr., "Lep. Krak.," p. 157 (1860); Staud., "Cat.," 1st ed., p. 5 (1861); Kirby, "Man.," p. 107 (1862); Now., "Mot. Gal.," p. 50 (1865); Rössl., "Schmett. Nass.," p. 16 (1866); Berce, "Faun. Fr.," i., p. 142, pl. vi., fig. 8 (1867); Nolek., "Lep. Fn. Estl.," i., p. 57 (1868); Butl., "Cat. Diurn. Lep.," p. 170 (1869); Newm., "Brit. Butts.," p. 131, fig. 44 (1871); Kirby, "Syn. Cat.," p. 368 (1871); Curò, "Bull. Soc. Ent. Ital.," vi., p. 112 (1874); Mill., "Cat. Léop. Alp.-Mar.," p. 104 (1875); Scudd., "Hist. Sketch," p. 209 (1875); Sand, "Lép. Ber. Auv.," p. 6 (1879); Frey, "Lep. Schweiz.," p. 19 (1880); Weiler, "Schmett. Tauf.-Thal.," p. 13 (1880); Rössl., "Lep. Wiesb.," p. 30 (1881); Kirby, "Eur. Butts.," p. 48, pl. xiv., figs. 6a-c (1882); Lang, "Butts. Eur.," p. 121, pl. xxvi., fig. 6 (1884); Berce, "Lép. Fr.," p. 16, pl. iii., figs. 11-12 (1884); Kane, "Eur. Butts.," p. 44, pl. iv., fig. 7 (1885); Buckl., "Larvæ.," i., p. 191, pl. xiv., fig. 3 (1886); South, "Ent.," xx., pp. 1 *et seq.*, pl. i., figs. 1-12 (1887); Auriv., "Nord. Fjär.," p. 15, pl. vi., fig. 6 (1888-91); Dale, "Hist. Brit. Butts.," p. 63 (1890); Brom., "Butts. Riv.," p. 39 (1892); Barr., "Lep. Brit. Isles.," i., p. 85, pl. xii., figs. 1-17 (1893); Meyr., "Handbk.," etc., p. 348 (1895); Tutt, "Brit. Butts.," p. 166, pl. ii., figs. 12, 13 (1896); "Ent. Rec.," vii., p. 220 (1896); Kirby, "Handbook, etc.," ii., p. 91, pl. xlvii., figs. 5, 6 (1896); Favre, "Macr.-Lép. Val.," p. 20 (1899); Wheeler, "Butts. Switz.," p. 31 (1903); Tutt, "Ent. Rec.," xviii., pp. 131-2 (1906); South, "Brit. Butts.," i., p. 167, pl. 109, figs. 1-12 (1906). **Corydonis**, Bergstr., "Nom.," iii., pl. lix., figs. 5-6 (1779).

ORIGINAL DESCRIPTION.—*Plebeji*. *Papilio Ruralis*. *Coridon*, P.P. alis ecaudatis subargenteis fascia marginali nigricante subtus canis subocellis plurimis. Posticis utrinque punctis ocellaribus marginalibus. Alæ inferiores subtus maculis ferrugineis trigonis, contiguis, submarginalibus. Magnitudo *P. argi* ac fortassis varietas (Poda).

IMAGO.—30mm.-46mm. ♂.—Of a delicate silvery-blue colour with ocellated border to hindwings, and dark border of varying width to forewings; nervures dark marginally; fringes white, chequered with blackish, the dashes enlarged on outer extremity; underside forewings whitish, hindwings yellowish; forewings with black discoidal lunule, submedian row of 7 and 2 (to 4) basal ocellated spots, margin ocellated and edged inwardly with dark grey (sometimes with faint orange lunules); hindwings with white discoidal, submedian row of 8 and 2 (to 4) basal ocellated spots; margin ocellated, edged inwardly with orange and grey chevrons. ♀.—Fuscous; forewings with discoidal and faint marginal ocellations; hindwings with weak discoidal, well-marked marginal ocellations edged internally with orange; fringes grey, strongly chequered with fuscous; underside brownish, of various tints, hindwings usually deeper coloured; spots as in the ♂ but larger, and orange lunules much stronger, especially on forewings.

SEXUAL DIMORPHISM.—The sexes are very distinct, the ♂ silvery-blue in colour, the ♀ brown, with a marginal row of orange-edged spots more strongly marked on the hindwings, although the latter is sometimes dusted with blue scales, and, in its extreme form, almost as blue as the ♂, but the scaling is very different, and the marginal spots

make the sexes quite easily distinguishable. On the underside, too, the ♀ is darker than the ♂, whilst usually the spotting is more strongly developed, and the individual spots larger. Pierce notes the scaling of the ♂ as follows: (1) The androconial scales oval,  $\cdot 001\text{in.} \times \cdot 0015\text{in.}$ , with long stalk, 9 rows of spots, each row making a thin line. (2) The transparent scales  $\cdot 003\text{in.} \times \cdot 002\text{in.}$ , greyish, the apex slightly rounded, sometimes with an uneven margin. (3) Dark scales scarce,  $\cdot 010\text{in.} \times \cdot 0015\text{in.}$ , two- and three-pointed. (4) Covering scales  $\cdot 022\text{in.} \times \cdot 0002\text{in.}$ , with 8 or 9 fine striæ. (5) The dark marginal scales are without yellow, three-pointed. Underside—the covering scales  $\cdot 006\text{in.} \times \cdot 002\text{in.}$ , three-pointed, otherwise similar to those of upper side. The covering scales of the ♀ are  $\cdot 006\text{in.} \times \cdot 005\text{in.}$ , four-pointed. No transparent scales except in the very blue ♀s, in which they are pinkish in colour, smooth, very highly refractive, and five-lobed. The underside scales four-pointed, with deep indentations.

GYNANDROMORPHS.—The following gynandromorphs are the only ones to which we have found reference.—

α.—The right pair of wings and right half of the body ♂, the left ♀. Captured at Blandford, July 30th, 1887 (Smith, *Ent.*, xxi., p. 13; *Proc. Sth. Lond. Ent. Soc.*, 1887, p. 93).

β.—Divided completely including the body, one side blue, the other brown. In the Webb coll. (Barrett, *Lep. Brit. Isles*, p. 87).

γ.—A gynandromorphous example captured August 23rd, 1887, on the Sheep Leas, Horsley, Surrey (Briggs, *Ent.*, xx., p. 266 and *in litt.*). Right side ♂, rather smaller than the left side which is ♀, sold for £3 5s. at Stevens' sale-rooms, October 27th, 1896, to Mr. S. Webb (*Ent. Rec.*, viii., p. 272 and Briggs *in litt.*).

δ.—Hermaphrodite; taken at Colmar in Alsace (Rühl, *Pal. Gross-Schmett.*, i., p. 278; Schultz, "*Woch. für Ent.*," i., p. 335).

ε.—The body and three of the wings apparently ♂, the left forewing and half of the thorax ♀, with some patches of blue scales on this wing; on the underside the specimen seems to be normal, except that there is a broad dark grey dash along the costal area of the left forewing. Taken at Purley by Mr. Kirkman (South, *Ent.*, xxxv., p. 2, p. 1, fig. 3).

ζ.—Imperfect gynandromorph. Shape and colour ♀. Along the right hindwing some very strong glistening blue streaks of ♂ colour run to the outer margin. Captured in the Engadine (Wiskott, *Lep.-Zwitter*, p. 13).

η.—Imperfect gynandromorph. Form and colour ♀. Right hindwing from the inner margin over the greater portion of the wing, covered with glistening blue scales like those of the ♂. Friedland in Silesia. Wiskott coll. (Wiskott, *Lep.-Zwitter*, p. 13).

θ.—♂, with the appearance of being ♀ marginally. Staudinger *in litt.* (Schultz, *Woch. für Ent.*, ii., p. 366). This is a ♂ in which the right hindwing has the blue colour extending only halfway towards the outer margin, moreover, the borders are much broader than is usually the case. Loc. Schweidnitz (Bang-Haas *in litt.*).

ι.—A specimen taken near Stonehenge, the upperside of ♂ coloration except the hind-margins which are broadly blackish-brown; the hindwings with the usual marginal spots as in ♀. The underside ♀ (Barrett, *Lep. Brit. Isles*, i., p. 86). [? This appears to be the ♀ form, *tithonus*, Meig. (= *syngrapha*, Kef.).]

κ.—♂ with a black-brown, wedge-shaped streak on the upperside of the right forewing, pointing inward from the margin. Briggs' coll. (Barrett, *Lep. Brit. Isles*, i., p. 86).

λ.—♀, with sundry dashes of ♂ colour towards the hindmargin of left hindwing only. Ventnor (South, *Ent.*, xx., p. 4).

μ.—♀. With a longitudinal streak of ♂ colour along the inner margin of left forewing, in addition to triangular dashes on hindwing. Ventnor (South, *Ent.*, xx., p. 4).

ν.—♀. Right forewing with three interneural ♂ blue dashes, one just above and parallel with the inner margin, one in the space above this, but more towards the outer margin, and one between the outer margin and the discoidal. Taken at Reigate, August 9th, 1907, by Dr. T. A. Chapman. Hodgson coll.

ξ.—♀. Left forewing with a somewhat large splash of ♂ colour, running from base parallel to inner margin in two lower interneural spaces, another dash from base to discoidal, then continued more finely nearly to outer margin. Dover, August 1903. Pickett coll.

ο.—♀. Brown, but with the left forewing above broadly scaled with bright blue along the costal margin. This specimen further tends to hermaphroditism in having the black points confluent near the lower border of the underside of the forewings. Vernet-les-Bains, July 1895 (Oberthür, *Etudes*, xx., p. 21).

π-ρ.—Two other ♀s show the same peculiarity, but on the right side (1) along the median nervure, (2) near the costal edge. Both from Battershell-Gill coll., the first labelled "Folkestone, 1881" (Oberthür, *Etudes*, xx., p. 21).

ς.—♀. Brown except that the left forewing has a broad band of ♂ colour extending along the inner margin from base to outer margin (widest at latter). Deal district (Kingsdown), August 1887. Tutt coll.

τ.—♀. Brown, except that the costal margin of the left forewing is broadly splashed above the discoidal with streaks of ♂ colour, extending almost from base to apex. Sandown, Isle of Wight, August 1881. Tutt coll.

υ.—♀. Left hindwing with a distinct dash of ♂ blue colour from the hind-margin to the centre of the wing. Croydon, July 4th, 1887. Clark coll.

TERATOLOGICAL EXAMPLES.—We find in this species some connection between pathological and teratological examples and the wing-markings, especially on the underside. Limiting the pathological aberrations to those that merely show superficial failure of wing-scaling and pigment, and the teratological to those that show modification in morphological structure—wingshape, antennæ, legs, etc.—one often finds that a very slight amount of crippling is accompanied by loss of spotting on the underside, or by change in the normal spotting; not that pathological or teratological examples may not be normally spotted, but the abnormally spotted—especially in the direction of obsolescence—almost always show some sign of injury, sometimes very slight and difficult to discover, and at others quite obvious. This is so in our own collection, and we have obtained from Pickett details of a very large number of obsoletely-marked examples, to the collecting of which he has paid special attention. To illustrate the connection he has tabulated the specimens as follows:—

No apparent injury in wings	..	..	..	♂ s	8	♀ s	8
Slight injury apparent	..	..	..	♂ s	100	♀ s	52
Serious injury apparent	..	..	..	♂ s	19	♀ s	5
No. of examples of ab. <i>obsoleta</i> ( <i>sens. lat.</i> ) examined.				♂ s	127	♀ s	65

The following are the teratological examples that have come under our notice:—

α.—♂. Of normal size, the left forewing with the outer margin drawn in at a sharp angle between the two lower (?) median nervules; the fringes developed normally in the depression. The other wings normal. Crissolo, August, 1901. Tutt coll.

β.—♂. Of large size, almost identical with the last, but the point at which the margin is drawn in, nearer the 3rd than the 4th (?) median nervules; a small corresponding kink in the left hindwing, interfering with the double marginal spot near anal angle. Above Preda, August 18th, 1907. Tutt coll.

γ.—♂. The left forewing very strongly drawn in (to an angular point), at the extremity of nervure iv. Thoiry, August 12th, 1908. Blachier coll.

δ.—♀. With slight angular notch in the middle of the outer margin of left forewing. Ste. Maxime, April, 1906. Chapman coll.

ε.—♂. The corner of the left forewing shortened or cut off sharply at apex, and the outer margin directly below the apex with a concave curve, ending about halfway down the outer margin, and then sloping almost normally to the anal angle. This wing is wider on the outer margin than the right forewing. South Foreland, August, 1887. Tutt coll.

ζ.—♂. Left wings both narrower than right wings. The left forewing curved in concavely from about halfway down outer margin to anal angle. South Foreland, August, 1887. Tutt coll.

η.—♂. Smaller than, but very similar to, last, except that instead of the left hindwing being narrower than the right, it is altogether smaller (but of similar shape), whilst the right hindwing is also rather smaller than normal; the outer margin of the left forewing bent in slightly concavely about one-third from the apex. South Foreland, August, 1887. Tutt coll.

θ.—♂. Large size. Left forewing with the outer half much contracted, so that the portion beyond the discoidal cell is pulled over, the apex much depressed, and the outer margin pulled back so that the anal angle ends (in the set insect) directly under the discoidal lunule; the whole of the triangular portion of the wing normally contained between the lowest point of the discoidal lunule, the anal angle, and the middle of the inner margin being abolished. A sort of scaleless scar directly below this point on the costa of the hindwing, and a similar scar on both right fore- and hindwing, but without malformation, suggest some pupal injury. The spotting of the underside of the deformed wing normal, a spot in each interneural space, except that the last three are indistinguishable. Useigne, August 13th, 1903. Tutt coll.

ι.—♂. Left hindwing, of a specimen of obsolete form beneath, with the interneural spaces 2, 3, 4, 5, towards the margin, somewhat puckered, and the four dark chevrons in these spaces pulled up as it were to a point some 3mm. or 4mm. above as dark little pyramids. This point or apex is the meeting-point of the three nervures coming from the 3rd, 4th, and 5th fringe marks, which nervures then again diverge, and shortly continue normally towards the base. Dover, August, 1906. Hodgson coll.

κ.—♀. Right hindwing puckered in the discoidal cell, drawing the wing in, and narrowing it along the costa. On the underside the discoidal spot destroyed, no submedian or basal spots, the wing being obsoletely marked, as also are the other three wings. Villars near Evolène, August 6th, 1899. Tutt coll.

λ.—♂. Right forewing humped towards base of costa, throwing the costal margin up convexly; the inner margin correspondingly thrown up, so as to form a curve almost parallel with the costa. A beautiful pale silvery specimen, mentioned *Trans. Ent. Soc. Lond.*, 1894, pp. xv.-xvi., as *albicans*?, but it is nothing like that form, and is perhaps referable to *albescens*, Ckll. Cuxton. Tutt coll.

μ.—♂. Of the *minor* form, with the left forewing narrowed, and the inner margin curled up for the outer three parts of its length. Val Vény, August 12th, 1905. Tutt coll.

ν.—♂. Of normal size. Left forewing narrowed, curved strongly convexly on costa, the outer margin somewhat waved, the inner margin drawn up medially, as if it had been caught by a thread; the left hindwing also narrower, but similarly convexly bent on the costa. Franzenshöhe, August 14th, 1909. Tutt coll.

ξ.—♂. Large size. Right forewing rounded and narrowed, and with a very different appearance from the large normal-shaped left forewing; the wing is particularly rounded at the anal angle. The other wings normal. Via Mala, August 23rd, 1907. Tutt coll.

ο.—♀. The left forewing contracted from the basal shoulder, making this wing only about two-thirds the width of the right forewing; the underside spotting of the wing normal, but the spots pressed closely together owing to closure of nervures. Cuxton, July 1st, 1893. Tutt coll.

π.—♂. Right forewing and hindwing narrower than left wings; the right forewing concave on the inner margin. Dover, August, 1904. Pickett coll.

ρ.—♀. Left wings both somewhat crippled; the forewing narrowed, with straight outer margin, the hindwing much narrowed throughout its full length. Underside of *antico-obsoleta* form. Ventnor, 1883. Adkin coll.

σ.—♀. Right forewing contracted on inner margin just within anal angle; underside of this wing less strongly marked than that of left forewing; but all the wings are of the *obsoleta-discreta* type of markings. Villars near Evolène, August 6th, 1899. Tutt coll.

τ.—♀. The right forewing narrowed and crumpled to about half its length, the apical costa curved, the outer margin concave, the fringes wholly fuscous. Right hindwing somewhat cut off at costa. The left wings normal in shape. Hindwings with blue scales over half of wing extending from base through

discoïdal cell to outer margin, and then back to inner margin; no blue scaling in other ♀s taken same time. The underside is of the *striata-obsolata* form, the left forewing strongly striate, both hindwings obsolete marked. The right forewing shows three small rounded dots (2nd, 3rd, and 4th of submedian series), a fourth (5th in series) a little lengthened, whilst the last two are extended under the small discoïdal and upper basal as a double line parallel to inner margin (= *biarcuata*); the only two spots on left, and four on right, hindwing are asymmetrical. Evolène, August 6th, 1889. Tutt coll.

v.—♀. Left hindwing slightly shortened compared with right, but much less wide; on the underside the submedian spots are obsolete in the narrower portion, and the area occupied by a roughly wedge-shaped white band extending from about the middle of the submedian area to the anal angle, and stretching past discoïdal towards base. Dover, September 15th, 1909. Hodgson coll.

φ.—♂. With the right forewing little less than normal in size, but sharper pointed at apex than corresponding left forewing; the right hindwing hardly two-thirds the size of the left hindwing. The undersides of both forewings of the *parisiensis* form, the hindwings normally spotted. Dover, August, 1887. Tutt coll.

χ.—♀. Left hindwing distinctly narrower than right; the costa hollowed and displacing the two costal spots which appear as a white streak along the hollowed costal margin. The other spots of the wing very few, two in submedian and one in basal series only. Susa, August, 1897. Tutt coll.

ψ.—♂. Right hindwing narrowed, with the costal portion towards the apex hollowed out for some distance. Underside asymmetrically obsolete; the injured wing strangely the best spotted. Dover, August, 1896. Pickett coll.

ω.—♀. Normal size. Left forewing with the outer margin cut off sharply, the inner margin being at least 3mm. less than that of the right wing. Dover, August, 1903. Pickett coll.

αα.—♂. Normal size. Apex of both forewings rounded or cut back; fringes perfect. Dover, August, 1905. Pickett coll.

ββ.—♀. Normal size. Right forewing rounded, almost the shape of a hindwing, the costa about two-thirds length of that of the left forewing; the cilia developed right round the outer margin and apical areas. Dover, August, 1905. Pickett coll.

γγ.—♂. Right fore- and hindwing of about two-thirds size of the left pair; underside of *obsolata* form. Dover, August, 1906. Pickett coll.

δδ.—♂. Left hindwing fringeless, shortened in length and width, underside obsoletely marked (as is also right hindwing), but the marginal lunules confined to the dark chevrons (no orange and no spots) which surmount long white wedges in each interneural space. Dover, August, 1906. Hodgson coll.

εε.—♂. Right hindwing replaced by a tiny winglet. On the underside the right and left forewings with one large and three small black spots outside the discoïdal lunule, left hindwing with three large ocellated spots. Gex, July 30th, 1904. Blachier coll.

ζζ.—♂. The right hindwing shrivelled beyond the discoïdal. On the underside the whole of the wing except the costa and base crumpled; the markings restricted to two spots in the submedian series, two costal and weak discoïdal. The markings of all the other wings, however, are of a very obsolete type. Near Gomagoi, August 13th, 1909. Tutt coll.

ηη.—♂. Of the ab. *minor* form. The right hindwing very much smaller than the left, perhaps not more than half the size. Dover, August, 1902. Pickett coll.

θθ.—♀. Right forewing a little shorter, but much narrower, than the left; all the interneural spaces well-supplied with blue scales; the right hindwing also narrower and thinly sprinkled with blue scales. The left wings normal and without blue. Bevendean, September 7th, 1888. Hodgson coll. [The appearance of blue on the malformed wings suggest whether the adverse conditions resulting in the malformation also had something to do with the development of the blue scales.]

ιι.—♂. Left hindwing with the inner margin excised from before middle to tornus. Clandon, July, 1900 (South).

κκ.—♀. Anal angle of left hindwing incised. Underside of *obsolata* form. Dover, August, 1903. Pickett coll.

λλ.—♀. Right hindwing considerably narrowed; marginal markings on upperside of this wing obsolete; on the underside the markings and the spotting



all absent, except a *costajuncta* mark, small white discoidal and one tiny basal spot; the marginal series replaced by obsolete whitish wedges. The left hindwing normally spotted beneath. Allos, August 14th, 1906. Tutt coll.

$\mu\mu$ .—♀. Right hindwing about half size of left hindwing, and considerably crumpled. Underside of *obsoleta* form on all wings. Dover, August, 1904. Pickett coll.

$\nu\nu$ .—♀. The left hindwing crumpled into a small scrap about 12mm.  $\times$  4mm. Underside of the *cinnus*, Gerh. (*postico-obsoleta*), form. Dover, August, 1904. Pickett coll.

$\xi\xi$ .—♀. Almost exactly like the last, but the left hindwing still smaller, the other wings normal. Dover, August, 1904. Pickett coll.

$\sigma\sigma$ .—A dwarf, with broad and rounded wings. Devizes, August, 1896 (Sladen, *Ent.*, 1897, p. 81).

$\pi\pi$ .—♂. An abnormal hindwing, longer and far broader than usual, with an indentation in the middle of the hindmargin, tending to show that it is a double wing, each half of which has nearly all the usual spots of a wing, reduced in size, on the underside. Briggs' coll. (Barrett, *Lep. Brit. Isles*, i., p. 86).

$\rho\rho$ .—♀. With a small extra fifth hindwing arising above and at the base of the left hindwing. Mason coll. (Mosley, *Nat. Journ.*, v. supp., 1896, pl. iv., fig. 10).

$\sigma\sigma$ .—♂ With the right hindwing very much narrower, the apex more pointed, and the inner margin shorter, than the left hindwing. Draguignan, May 3rd, 1905. Tutt coll.

We noticed eleven other ♀s, all with obsolete markings on the underside (ab. *obsoleta*) in Pickett's coll., which show traces in one wing or more, of malformation, sometimes very slightly, and only modifying the markings asymmetrically, but, in others, extending to the excision of considerable areas on the margins of a wing or wings, suggesting strongly that the obsolete markings have, in some manner, a causation in physical weakness. Tunaley observes (*Proc. Sth. Lond. Ent. Soc.*, 1895, p. 63) the tendency of the hindwings sometimes to be angular rather than rounded; this is a not uncommon tendency in other allied species.

**PATHOLOGICAL EXAMPLES.**—The following are the pathological examples that have come under our notice:—

$\alpha$ .—♂. The fore- and hindwings of a very delicate cream colour=ab. *lacticolor*, n. ab. (Pearce, *Ent. Rec.*, xx., p. 20).

$\beta$ - $\gamma$ .—♀s. Two small pale fawn-coloured females in the Brit. Mus. coll. labelled "Mutzell coll."

$\delta$ .—♀. A beautiful fawn colour or pale cinereous replacing the usual very dark brown ground colour. Folkestone, August, 1880 (Hodge).

$\epsilon$ .—♀. Normal size. Of an uniform pale fawn-brown colour, roughly similar to that of *Coenonympha pamphilus*. No fringes. Although the example is no doubt considerably worn, it must be conceded to have been originally a very pale ill-pigmented specimen. Dover, August, 1900. Pickett coll.

$\zeta$ .—♂. The cilia wholly white, and the anal angle also white. Briggs' coll. (Barrett, *Lep. Brit. Isles*, i., p. 85).

$\eta$ .—♂. Right forewing with large pale patch occupying triangular portion of wing, from the outer margin to the middle of the lower edge of discoidal cell, and back to the anal angle. Ste. Maxime, April, 1906 (Chapman).

$\theta$ .—♂. Of normal size, right hindwing with the apical portion of costa with weak, pallid (grey) scaling. Dover, August 1904. Pickett coll.

$\iota$ .—♂. Small dark patch near anal angle of right wing. Dover, August, 1903. Pickett coll.

$\kappa$ .—♂. Left forewing with pallid patch at apex, the inner margin of the same wing curled. Dover, August, 1906. Pickett coll.

$\lambda$ .—♂. Normal size. Outer margin of left fore- and hindwing of a pallid blue colour (tending to lilac, the margin brown, and the fringes spotless. The right pair of wings normal. Dover, August, 1907. Pickett coll.

$\mu$ .—♂. Normal size. The apex of the right forewing rounded, the scaling of the outer half of wing weak, and carrying a broad dark margin twice the width of that on the left side, the fringes white; left side normal. Dover, August, 1905. Pickett coll.

ν.—♀. The apical areas of the right fore- and hindwing ill-pigmented, the brown parts pale, and in the hindwing the orange parts yellow. The Fauville, July 27th, 1904. Tutt coll.

ξ.—♀. A small patch, extending from about halfway up the outer margin of the left forewing to the anal angle, about 3mm. wide, pallid, and the fringes without dark streaks. Underside equally pale. Villar near Evolène, August 6th, 1899. Tutt coll.

ο.—♀. Normal size. With a pale blotch running from the anal angle nearly to the discoidal of the left hindwing. Dover, August, 1903. Pickett coll.

π.—♀. Normal size. With a small roundish pallid patch near the anal angle of both forewings. Dover, August, 1903. Pickett coll.

ρ.—♀. Large size. With two moderately large whitish patches (1) Near the apex of the right forewing, and (2) On the inner margin of the right hindwing. Evidently these two portions of the fore- and hindwing were situated under each other in the pupal stage. Dover, August, 1904. Pickett coll.

σ.—♀. The left pair of wings slightly smaller than the right pair. The left forewing with two smaller patches than in last (1) outside discoidal of left forewing, (2) outside discoidal of left hindwing. These two portions of wing no doubt under each other in pupa. Dover, August, 1903. Pickett coll.

Barrett observes (*Lep. Brit. Isles*, i., p. 85) that, in the "Stevens' coll.," were "a series of ♂s stunted in size or slightly crippled, in which the blue scales are partially absent or entirely absent from patches on one or more of the wings, leaving the patches brownish;" also "larger and more perfect specimens, still thinly scaled and of brownish-blue or purplish, evidently the victims of insufficient or withered food;" also "a ♂ from Wiltshire of a strange dark steel-blue with broad brown margin and buff cilia." The same author (*op. cit.*) speaks of ♂s "almost white," other ♂s "with whitish dashes from the margin of the upperside," others "dark grey or steel-colour" in the Webb coll. Webb notes (*Ent.*, xxi., p. 134) that specimens occur "occasionally at Dover with an apparent defect in the mature scaling of the wings, making the insects affected look shining almost as though they had been dipped in oil."

VARIATION.—The variation of this species, in both sexes, is most interesting. In its extreme south-eastern and south-western limits a remarkable parallelism of variation is set up, a parallelism that is in no way to be considered as producing identical forms, for, though a similarity in the specialisation of colour is most noticeable, differences in tint, size, and to some extent shape, make the races of Spain and Asia Minor recognisable at a glance. Along the Riviera of France and Italy, the peculiar conditions of which appear to produce regularly a double-brooded or partially double-brooded race, other marked conditions prevail and stamp the species here very definitely, although in no wise comparable with the Spanish races, *albicans*, Bdv., *arragonensis*, Gerh., *hispana*, H.-Sch., etc., or the eastern races, *olympica*, Led., *corydonius*, H.-Sch., *caucasica*, Led., or *syriaca*, Tutt. One of these Rivieran races, we have known for some time as *meridionalis*; what is apparently another was described in 1904 by Bartel from Italian specimens as *rezniccki*, his description (largely comparative) leaving considerable doubt as to whether the examples described from Rapallo, are really the same as those from Hyères, Ste. Maxime, Draguignan (= *meridionalis*), or again those taken at Pardigon (for which Reverdin proposes the name *constanti*). At any rate, the long series of Rivieran specimens (*meridionalis*) in our possession is much nearer in the ♂s to typical central European specimens (in some cases practically indistinguishable) than are any of the races from Spain and Asia Minor already

noticed (*suprà*). Apart from these, the general similarity of the species in all parts of its range is very striking, although still subject to considerable aberrational variation, and one obtains almost exactly the same range of forms between Franzenshöhe and Ferdinandshöhe on the Stelvio, at from 7500 to 9000ft. elevation, as at Gex in the Jura, Mt. Salève in Haute Savoie, Digne in the Basses-Alpes, Fontainebleau Forest in Central France, Torre Pellice in Piedmont, Dover and Cuxton in Kent, Guildford in Surrey, and Assisi in the Apennines, and any attempt like that of Neustetter (*Int. Ent. Zeit. Guben*, iii., p. 198) to set up as racial the ordinary mountain specimens, shows a complete failure to understand the real variation of the species. The colour variation of the ♂s, though wide, is not remarkable outside Spain and Asia Minor, yet the shades of silvery-blue or silvery blue-green in the ground colour, may be extreme, and extend from a pallid thinly-scaled whitish form (ab. *albescens*, Ckll.), or a very well-scaled pale silvery-blue form (= *apennina*, Zell.), through almost every tint of silvery-blue until it reaches a bright glossy silver-blue (*hispana*, H.-Sch.), approaching, but in its most advanced examples (*hispana* ab. *coelestis*, n. ab.) falling perhaps just short of, the tint of *A. thetis*, or silvery blue-green (ab. *viridescens*, n. ab.); but the most blue ♂s found in Britain and Central Europe never reach the *hispana* standard of blue, however nearly they may be sometimes said to approach it. Oberthür notes (*Etudes*, xx., p. 21) a ♂ taken at Dover, 1878 (Howard-Vaughan coll.), and two ♂s (Bellier coll.) of a pale grey colour, scarcely bluish, and with the upper edge of the marginal ocelli of the hindwing tinged with fulvous = *grisea-suavis*, n. ab. The amount of modification of the dark margin, brings in another item to be considered in its general colour-scheme. There is, in addition, a distinct difference produced by the variation in the quantity and length of the hair-scales, and the ♂s that are almost devoid of the latter (ab. *glabrata*, n. ab.) exhibit their shiny underscales, and present a remarkably characteristic appearance due to the absence of the silky look that usually marks the species. Among these smoother examples occurs a rare form with the ground colour strongly suffused, resulting in a brownish-grey hue, due to the development of a large number of small dark scales, but so thin is the scaling compared with the normal, that the markings of the underside show fairly distinctly through (= ab. *suffusa*, Tutt). Hodgson notes (*in litt.*) a brownish-drab ♂ taken in Surrey, and we have a more plumbeous example from Jaca in the Spanish Pyrenees (ab. *plumbescens*) a mere modification apparently of the *suffusa* form. Reverdin notes the Savoy and south-west Swiss examples as not very variable, sometimes more shiny and more silky, at other times more dull, the Rivieran race, he says (from Pardigon), being strikingly greyer and duller than the Swiss and Savoy races; whilst Blachier notes the colour of *A. coridon* as more or less bright silvery-blue, sometimes very pale, sometimes very deep. The border varies very considerably, and may consist of little more than a mere line (*angustimargo*, n. ab.), or it may be developed into a deep black band 3mm.-4mm. (type) in extent, or it may be grey, or brownish, or dark and ill-defined inwards, or diffused into the ground colour at some distance from the margin, sometimes extending over fully the outer third of the wing, and sometimes further suffused along the costa as far as the discoidal lunules (= ab. *marginata*, Tutt); racially the most suffused

borders appear to be exhibited locally by specimens from the mountains of Bosnia, Tyrol, and certain parts of Germany (where the species is single-brooded), and in the spring examples of the Rivieran race. The marginal band may be considered as normally being made up of the dark border and a series of interneural marginal spots. In the forewings the marginal area may be pale with a marginal series of small grey ocellated spots (=ab. *apennina*, Zell.), or there may be only the row of spots on a ground little or not at all modified (=ab. *punctata*, Tutt), or they may be largely lost in the border and only noticeable by their greyish inner edges (=ab. *subfusca*, n. ab.), whilst, in others, a narrow black border has its inner edge marked off as a series of whitish lunules (=ab. *albocrenata*, n. ab.), or it may be wide, with the inner edges of the ocelli appearing as a dividing line down the greater part of length of the band (ab. *divisa*); in others, the narrow black border (*angustimargo*), or wide (type), or very wide border suffused inwardly (*marginata*), may have no real trace of the ocelli, the sharply-defined wide-bordered form of this series, without special suffusion medially and on the costa, as noted above, belonging to the type. The border of the hindwings is usually narrower, and the interneural spots well-defined, and the latter may be (a) entirely circled with whitish (= *cineta*, n. ab.), (b) edged on the external half only with pale (= *semicineta*, n. ab.), (c) edged externally and at sides, the black spots running into the wing as little wedges (*cuneata*, n. ab.), whilst, in some rare instances, the spots are merged in the border, except those nearest the anal angle, (d) the marginal spots being directly sessile on margin without pale external edging (*sessilis*). The presence of small orange chevrons, surmounting spots 2 and 3 (sometimes also 4 and 5) on the hindwings, is not uncommon (=ab. *suavis*, Schultz). The discoidal spots are occasionally well-developed on the forewings (= *torquimensis*, Hav.), sometimes on all four wings (= *quadrilunulata*, n. ab.). In the var. *aragonensis* they are typically present as a fine dark line (often edged with pale) on the forewings, and as a tiny pale circle on the hindwings (almost as in the ♀ ab. *tithonus*, Meig.). They are remarkably well-developed as four linear lunules in a ♂ from the Wormser Joch; they are faintly traceable on the forewings in several specimens from La Grave, Bourg d'Aru, Grésy-sur-Aix, Chavoire, Bourg St. Maurice, Mendel-Pass, Trafoi, St. Anton, Cortina, Pré St. Didier, Bobbie, Val Tournanche, Igman, Zernetz, the Ofen Pass, Simplon (2nd refuge), etc., and are specially strongly developed in a specimen of the ab. *plumbescens*, from Jaca (on the Spanish side of the Pyrenees). Many of these examples show a tendency to suffusion in the ground colour. Yet the darkening of the lunules appears, on the whole, to be rare in Swiss examples, and Reverdin notes only 3 out of 151 ♂ s, from Switzerland, France, and Hungary, with the lunule showing as a streak at the extremity of the discoidal cell of the forewings, and Blachier only notes 4 in his collection. It is, however, quite a feature of the Rivieran races, occurring in them quite commonly; there are many in Chapman's long series from Ste. Maxime (*meridionalis*), Reverdin mentions it (*in litt.*) as characteristic of his (as yet unpublished) *constanti*, and Wheeler notes it as being visible in all his specimens from Le Canadel near Hyères, and in most of those from Fiesole, as well as in one or two from Guildford, though he does not find it in any of his Swiss specimens, nor in any of those taken at Assisi. Stefanelli says that,

in Tuscany, the chief variation in the ♂s (both from the plain and hills) is in the breadth and intensity of the dark outer marginal band of the forewings, in some narrow but decidedly black, in others more developed, but much paler, whilst in others it is much broader than usual. The fringes of the ♂ vary somewhat in the whiteness of the tint, but more in the blackness or brownness of the dashes, and in their width; they are always, however, widest on the outer margin, and the fringes may be black-chequered, wholly white (*albofimbriata*, n. ab.), or white edged with black (*albonigrofimbriata*, n. ab.). The black dashes are almost always more feebly developed on the hind- than on the forewings. We have many examples with quite white fringes to the hindwings (*semi-albofimbriata*), but very few with them quite white on the forewings if a lens be used; there is one example from the Weesen Marsh, another from Arolla, another from Andermatt, another from Simplon, another from St. Moritz, another from Abriès, and another from Grésy-sur-Aix, with almost entirely white fringes on fore- and hindwings. Blachier notes one from Moutiers with white hindwing fringes, but faintly marked with grey on forewings, and Reverdin a similar one from Sierre; Wheeler observes that there is never more than the faintest indication of dark lines in the fringe of the hindwings of his Assisi specimens, and that they are sometimes perfectly white; the forewings also generally having the dark lines only very slightly marked; Weir notes (*Proc. Sth. Lond. Ent. Soc.*, 1886, p. 60) an example that had the fringes spotless white; Pickett also records (*op. cit.*, 1902, p. 114) ♂s from Dover with nearly white fringes. South exhibited at the meeting of the South London Entomological Society, held on October 26th, 1893, a specimen with its fringes perfectly white. The following tabulation helps to show the range of variation in the ♂s of this species combining the colour and modification of the margin of the forewing:

- 1.—Pale silvery-blue, with marginal series of pale interneural lunules=ab. *fowleri-pallidula*, n. ab.
- 1a.—Pale silvery-blue with indistinct greyish marginal ocellated spots=ab. *apennina*, Zell.
- 1b.—Pale silvery-blue with well-developed marginal ocellated spots=ab. *punctata-pallidula*, n. ab.
- 1c.—Pale silvery-blue with narrow blackish border, spots only appearing as whitish marginal lunules=ab. *albocrenata-pallidula*, n. ab.
- 1d.—Pale silvery-blue with wide blackish border, spots showing only their greyish inner edges=ab. *subfusca-pallidula*, n. ab.
- 1e.—Pale silvery-blue with wide blackish border, divided throughout by pale line=ab. *divisa-pallidula*, n. ab.
- 1f.—Pale silvery-blue with wide blackish border, extending suffusedly towards disc and along costa=ab. *marginata-pallidula*, n. ab.
- 1g.—Pale silvery-blue with narrow black border without marginal spots=ab. *angustimargo-pallidula*, n. ab.
- 1h.—Pale silvery-blue with broad black border without marginal spots=*coridon*, Poda.
- 2.—Bright silvery-blue, otherwise as in 1 =ab. *fowleri*, South.
- 2a.—Bright silvery-blue, otherwise as in 1a=ab. *indistincta*, n. ab.
- 2b.—Bright silvery-blue, otherwise as in 1b=ab. *punctata*, Tutt.
- 2c.—Bright silvery-blue, otherwise as in 1c=ab. *albocrenata*, n. ab.
- 2d.—Bright silvery-blue, otherwise as in 1d=ab. *subfusca*, n. ab.
- 2e.—Bright silvery-blue, otherwise as in 1e=ab. *divisa*, n. ab.
- 2f.—Bright silvery-blue, otherwise as in 1f=ab. *marginata*, Tutt.
- 2g.—Bright silvery-blue, otherwise as in 1g=ab. *angustimargo*, n. ab.
- 2h.—Bright silvery-blue, otherwise as in 1h=ab. *caeruleo-marginata*, Tutt.
- 3.—Pale silvery greenish-blue, otherwise as in 1=ab. *fowleri-viridescens*, n. ab.
- 3a.—Pale silvery greenish-blue, otherwise as in 1a=ab. *indistincta-viridescens*, n. ab.

- 3b.—Pale silvery greenish-blue, otherwise as in 1b=ab. *punctata-viridescens*, n. ab.  
 3c.—Pale silvery greenish-blue, otherwise as in 1c=ab. *albocrenata-viridescens*, n. ab.  
 3d.—Pale silvery greenish-blue, otherwise as in 1d=ab. *subfusca-viridescens*, n. ab.  
 3e.—Pale silvery greenish-blue, otherwise as in 1e=ab. *divisa-viridescens*, n. ab.  
 3f.—Pale silvery greenish-blue, otherwise as in 1f=ab. *marginata-viridescens*, n. ab.  
 3g.—Pale silvery greenish-blue, otherwise as in 1g=ab. *angustimargo-viridescens*, n. ab.

3h.—Pale silvery greenish-blue, otherwise as in 1h=ab. *viridescens*, n. ab.

In a similar manner *hispana*, with its bright lavender-blue tint, shows the whole series of marginal aberrations, and we find *indistincta-hispana*, *punctata-hispana*, *albocrenata-hispana*, *subfusca-hispana*, *angustimargo-hispana*, and *latimargo-hispana*, the typical *hispana* being of the *divisa* form, and similarly the *suffusa*, *plumbescens*, and other forms vary with regard to the margin. The hindwing groups (*antea* p. 10) are also traceable through all the different variations of ground colour as (1) *pallidula-cincta*, *pallidula-semicincta*, *pallidula-cuneata*, *pallidula-sessilis*, *pallidula-suavis*; (2) *caeruleocincta*, *caeruleosemicincta*, *caeruleo-cuneata*, *caeruleosessilis*, *caeruleosuavis*, and (3) *viridescens-cincta*, etc. So much for the ♂ s. The ground colour of the upperside of the ♀ s varies considerably in the direction of the brown ground colour (*brunnescens*) being more or less blackish (*atrescens*), the palest forms we have seen being those belonging to the Spanish var. *albicans*, Bdv. The margin varies considerably; in the most extreme form the ground colour extends to the outer edge, with no trace of ocellation on the forewing, and little or none on the hindwing (ab. *unicolor*, n. ab.). The marginal spots first become edged externally with whitish or greyish, forming an inconspicuous margin (ab. *subocellata*, n. ab.), and then inwardly with fulvous lunules first on the hindwing where this tint becomes very well-developed, whilst a greyish outline suffices to mark the marginal ocelli of the forewing (ab. *subaurantia*, n. ab.), and when they show on the forewing, commence from the anal angle upwards (ab. *peraurantia*, n. ab.), until a well-defined continuous band of orange crescents crosses both wings, although more strongly marked on the hindwings (ab. *aurantia*, Tutt). Whitish secondary crescents, surmounting the black border edging the orange lunules of the hindwings inwardly, are sometimes developed (*subalbolumulata*, n. ab.), and, in rarer cases, these white lunules extend to the forewings in the form of a single or double series of curved spots (*albolumulata*, n. ab.), a form of variation extending to the discoidal spots which are frequently surrounded with white on the forewings (ab. *albicincta*, Tutt), and may be similarly ringed or replaced by white dots on the hindwings (ab. *albi-puncta*, n. ab.). Occasionally the lunules noted above are blue instead of white (*caeruleolumulata*), and the discoidal are blue-ringed (*caeruleocincta*) or blue-spotted (*caeruleopuncta*), whilst the lunules may be replaced by a series of blue wedge-shaped dashes (ab. *caeruleo-cuneata*, n. ab.). South figures a good example of *albolumulata* and *albicincta* combined (*Ent.*, xx., pl. i., fig. 11), and states that he took 3 of these and 20 examples of ab. *albicincta* at Ventnor in one season. It is, however, in the direction of the blue scaling that the female is most variable. In some examples only the basal areas of the wings are strewn with blue scales (ab. *basicaeruleata*, n. ab.), in others the blue scales extend as interneural wedges from the base as far as, or rather beyond, the discoidal, suffusing the basal and discal areas (=ab. *subradiosa*, n. ab.), in others more extreme the blue covers the hindwing to the margin, and the forewing as far as the discoidal (=semi-

*syngrapha*, Tutt), whilst finally, the fore- and hindwings, except the costæ, are thickly covered with brilliant blue scales, in which the discoidals (sometimes two, at others four) stand out plainly (=ab. *tithonus*, Meig. = ab. *syngrapha*, Kef.), and this beautiful form also shows considerable modification in detail as to the character of the margin and the orange lunules. Millière and Gaschet both name blue-rayed forms in which the nervures are blue and the interneural spaces dark, in our experience an unusual form of variation; these we have described later. Hodgson notes (*in litt.*) that the white intra-marginal line of the hindwing is only exceedingly rarely replaced by blue (*caeruleineata*), although so commonly the case in *A. thetis*. One suspects that the striking examples with asymmetrical blue streaks and patches of ♂ colour on different wings (ab. *inaequalis*, Tutt) are gynandromorphic in some degree; we have dealt with these already (*antea*, pp. 3-4). It may be also noted that the orange chevrons may be present or absent in all the blue forms, and thus one may get a combination of *unicolor* or *sub-aurantia* or *peraurantia* or *aurantia* with any of the blue forms *basicaeruleata*, *subradiosa*, *semisyngrapha*, or *tithonus*. Blachier notes that in the neighbourhood of Geneva and in Savoy, a few ♀s have the bases of the hindwings scaled with blue and a feeble trace of blue scales at the base of the forewing, but such are rare; the most extreme example he has (taken on Mt. Salève, September 3rd, 1885), shows the hindwings with the basal half and the anal border sprinkled with blue scales; it is a remarkable fact that, of all the specimens we have captured abroad, only one from Airolo and another from Useigne have slight traces of blue scaling on the upperside of the hindwings, yet, in England, especially among the latest examples to appear, and in certain districts, it is one of the commonest forms of aberration. Trautmann is one of the few German lepidopterists who records blue-scaled ♀s, and he notes them as not uncommon at Jena (*Ent. Zeits. Guben*, 1908, p. 162), whilst Neustädt and Kornatzki speak of it as being common in Silesia (*Schmett. Schles.*, p. 46). Wheeler notes that, among all the specimens he has taken and observed in Switzerland, only one ♀, taken at Bérisal, shows any blue; this has a fair amount of blue scaling at the base and inner margins of all four wings. Jones also notes a ♀, captured July 31st, 1900, at Lago di Loppio, brown on the forewings, blue on the hindwings, the underside nearly devoid of spots except a large central one on each hindwing (ab. *corydonis*, Bergs.). In certain parts of France, however, the ♀s are as frequently scaled with blue as in England, *e.g.*, Pierret notes that, in the Forest of Chantilly, on the slopes of Lamorlaye, ♀s with ashy-blue scaling occur as commonly as dark ♀s. Oberthür states (*Etudes*, xx., p. 21) that he has seventeen Spanish ♀s not differing *inter se*, of a less dark brown tint than French examples, and quite without blue scales, as also are our own Spanish examples. The fringes of the ♀ may be whitish or greyish, chequered with brown, or they may be pale brown chequered with a rather darker shade; so heavily chequered are the fringes of the forewings sometimes, and so dark the ground colour, that they are almost unicolorous (*fuscofimbriata*). Reverdin notes a ♀ from the Bois Taille (near Geneva), in which the pale part of the fringes of the forewings is reddish-grey, and the brown streaks very wide and dark, the fringes of the hindwings also less pale than usual, but not so markedly different from the normal as are those of the forewings. He further observes that



the ♀s from Valais, Savoy, and the district around Geneva, may have the forewings almost unicolorous, or marked with ill-defined whitish or fulvous marginal lunules, lacking towards apex, and larger at the inner margin than towards the costa, the concavity of these lunules turned outwards, so that they surround a series of indistinct, but traceable marginal spots; the hindwings with the orange lunules more or less well-defined, in front of a series of seven black marginal dots, the two hindmost in the same space, the foremost least marked and often absent; in one ♀ from Arolla, only traces of spots 5, 6, and 7 are present, the forewings being quite unicolorous. Blachier records a ♀ from Thoiry, with bright orange-red lunules on the forewings and hindwings so strongly marked that, on the hindwings, they almost form an antemarginal orange-red band (ab. *aurantia*), sometimes they are pale yellow (=ab. *flavescens*, n. ab.); ♀s with the black chevrons of the orange marginal lunules themselves surmounted by white (ab. *albolunulata*) are recorded from Versoix, Mornex, etc.; Wheeler has a ♀ from the second Refuge on the Simplon Pass with an almost continuous orange band on the hindwings, and a broken orange band continued almost to the apex of the forewings (ab. *aurantia*), and another from Aigle in which a narrower orange band is almost unbroken on the hindwing, though the orange is barely visible on the forewing (ab. *peraurantia*). He also notes that, in his Italian specimens, the orange chevrons, though generally indicated on the hindwing, are as a rule narrow and inconspicuous, and do not extend to the forewing (ab. *subaurantia*); there is, however, one among his specimens from Assisi in which they are rather strongly marked on the hindwing, while they are also visible on the forewing in one specimen from Fiesole, and in the only example (a very large one) taken by him at Monte Orvieto. The following is a clumsy attempt to group the various forms of the ♀s of this species without attempting to differentiate the difference in ground colour:—

- 1.—With no orange lunules=ab. *unicolor*, n. ab.
- 2.—With indistinct marginal spots faintly edged with greyish=ab. *subocellata*, n. ab.
- 3.—With orange lunules on hindwings only=ab. *subaurantia*, n. ab.
- 4.—With orange lunules on hindwings faint on forewings=ab. *peraurantia*, n. ab.
- 5.—With orange lunules on all wings=ab. *aurantia*, Tutt.
- 6.—With orange lunules of hindwings surmounted by white secondary lunules=ab. *subalbolunulata*, n. ab.
- 7.—With orange lunules of both wings surrounded by white secondary lunules=ab. *albolunulata*, n. ab.
- 1a.—As in 1, but basal area (not reaching discoidal) of wings scaled with blue=ab. *basicaeruleata*, n. ab.
- 2a.—As in 2, but basal area of wings scaled with blue=ab. *caeruleosubocellata*, n. ab.
- 3a.—As in 3, but basal area of wings scaled with blue=ab. *caeruleosubaurantia*, n. ab.
- 4a.—As in 4, but basal area of wings scaled with blue=ab. *caeruleoperaurantia*, n. ab.
- 5a.—As in 5, but basal area of wings scaled with blue=ab. *semiaurantia*, Tutt.
- 6a.—As in 6, but basal areas of wings scaled with blue=ab. *caeruleosubalbolunulata*, n. ab.
- 7a.—As in 7, but basal areas of wings scaled with blue=ab. *caeruleoalbolunulata*, n. ab.
- 1b.—As in 1, but with forewings blue-scaled basally and hindwings scaled with blue (usually interneurally) to or almost to marginal area=ab. *subradiosa*, n. ab.
- 2b.—As in 2, but with forewings blue-scaled basally and hindwings scaled with blue (usually interneurally) to or almost to marginal area=ab. *radiosubocellata*, n. ab.



- 3b.—As in 3, but with forewings blue-scaled basally and hindwings scaled with blue (usually interneurally) to marginal area=ab. *radiosubaurantia*, n. ab.
- 4b.—As in 4, but with forewings blue-scaled basally and hindwings scaled with blue (usually interneurally) to marginal area=ab. *radioperaurantia*, n. ab.
- 5b.—As in 5, but with forewings blue-scaled basally and hindwings scaled with blue (usually interneurally) to marginal area=ab. *radioaurantia*, n. ab.
- 6b.—As in 6, but with forewings blue-scaled basally and hindwings scaled with blue (usually interneurally) to marginal area, secondary marginal lunules white=ab. *radiosubalbolutata*, n. ab.
- 7b.—As in 7, but with forewings blue-scaled basally and hindwings scaled with blue (usually interneurally) to marginal area, secondary marginal lunules white=ab. *radioalbolutata*, n. ab.
- 1c.—As in 1, but with forewings scaled basally to discoidal, hindwings entirely to margin=ab. *semisynggrapha*, Tutt.
- 3c.—As in 3, but with forewings scaled basally to discoidal, hindwings entirely to margin=ab. *semisynggrapha-subaurantia*, n. ab.
- 4c.—As in 4, but with forewings scaled basally to discoidal, hindwings entirely to margin=ab. *semisynggrapha-peraurantia*, n. ab.
- 5c.—As in 5, but with forewings scaled basally to discoidal, hindwings entirely to margin=ab. *semisynggrapha-aurantia*, n. ab.
- 1d.—As in 1, but with all wings (except costæ) scaled with blue to marginal area=ab. *excelsa*, n. ab.
- 3d.—As in 3, but with all wings (except costæ) scaled with blue to marginal area=ab. *tithonus*, Meig.
- 4d.—As in 4, but with all wings (except costæ) scaled with blue to marginal area=ab. *pertithonus*, n. ab.
- 5d.—As in 5, but with all wings (except costæ) scaled with blue to marginal area=ab. *aurotithonus*, n. ab.

There is considerable difference in size, and, in series, the ♀s look distinctly smaller than the ♂s, and the very high mountain specimens less than those of the lowlands; often the size is indicative of race, as noted in our account of var. *arragonensis* and var. *hispana*, and one observes that the very high mountain race of the Hautes- and Basses-Alpes, from Abriès, Larche, etc., averages only 35.5mm., whilst the race from Bourg St. Maurice averages fully 42mm., some ♂s reaching 46mm. Our ♂s from the Salève measure from 37mm.-40mm., and the ♀s 35.1mm.-37.5mm., ♂s from Useigne 46mm., ♀s from Bérisal, Col de Forclaz, Saas-Fée 40mm., and from Weesen Marsh 41mm. Blachier notes the largest ♂ that he has from the Geneva dist. as 42mm., and the largest ♀ 40mm. Occasional large examples come from most lowland localities, e.g., Bourg d'Oisans 44mm., Clelles 44mm., Grésy-sur-Aix 44mm., Digne 42mm., Fontainebleau 42mm., Bourg St. Maurice 46mm., Val Anzasca 44mm., whilst an example of *albicans* (from Granada) reaches 48mm., a ♂ *arragonensis* (from Albarracin) 46mm., a ♂ *caucasica* 44mm. Our largest ♀ *albicans* measures 42mm., a large ♀ from Gex 40mm., from Digne 41mm., from Bourg St. Maurice 40mm., from Fontainebleau 42mm., from Trafoi (several) 40mm.-42mm., San Salvatore, 42mm. Anything above 40mm. should be considered ab. *major*. Occasional small examples of both sexes appear to occur almost anywhere, and those below 30mm. look exceedingly tiny. We have a ♂ from Clelles 29mm., another from above Pré St. Didier 27mm., from Courmayeur 27mm., Val Bigontina 29mm., etc. Blachier records both ♂s and ♀s of 30mm. expanse from Valais, Val Maggia, Versoix, Simplon, Val Anzasca, and the Salève, all districts that usually produce well-developed examples. Reverdin notes his smallest ♂ as coming from Brides-les-Bains, and ♀ from Saas-Fée. Anything below 32mm. is certainly ab. *minor*. Pickett has, in his collection, a considerable number of both sexes (from near Dover) below 30mm., and some ♂s under 25mm. (measured from

centre of thorax to apex of forewing  $\times 2$ ), these are indeed *minutissimus*, the smallest  $\sigma$  measures only 23mm. His largest British  $\sigma$  is 41mm., his largest  $\rho$  39mm. There is considerable sexual difference in the coloration of the underside of this species, that of the  $\sigma$  being, as a rule, lighter than that of the  $\rho$ , yet it might be difficult, in particular cases, to distinguish one from the other, so closely do the  $\sigma$ s in their darker forms approach the paler  $\rho$ s; on the whole, however, the underside of the  $\sigma$ s incline to whitish or whitish-grey, tinged with fawn or grey-brown, whilst that of the  $\rho$  is pale brown, more heavily shaded with darker brown. The palest undersides of the  $\sigma$  are of a clear chalky-white, the hindwings with the faintest possible tinge of fawn (*ab. pallida*, Tutt); just in advance of these the ground colour is whitish-grey, the hindwings tinged with greyish- or yellowish-fawn (*grisescens*, n. ab.); sometimes the shading becomes strongly tawny (*fulrescens*, n. ab.), and it may be quite dark grey, the hindwings distinctly tinged with brown (*fuscescens*, n. ab.); this latter form is common to both sexes, the grey ground colour of the forewings in the  $\rho$  being usually due to the development of the pale ground along the nervures. The ground colour of the underside of the  $\rho$  is, however, usually brown rather than grey-brown, generally with more fully brown hindwings (*brunnescens*, n. ab.), and, in more extreme cases, becomes so dark that the ground of the hindwing tends to coffee- or even chocolate-brown (*castanea*, n. ab.). The difference between the tint of the fore- and hindwings may be very slight, on the other hand, it is sometimes markedly different. It is also to be noted that the colouring of the underside is often racial, and the specimens are apparently whitish when the insect occurs on steep mountain or hill slopes of limestone with sparse herbage. We notice them as particularly white on all the slopes in the Trafoi-thal between Gomagoi and Ferdinandshöhe, between St. Anton and the top of the Arlberg Pass, on Mt. Salvatore, above Piora, at Arolla, at Bourg d'Aru in the Dauphiny Alps, etc.; where the insect occurs on thickly-clad downs, etc., the ground colour is generally, in both sexes, darker, hence one suspects the colour has some distinct protective value. The spotting of the underside shows considerable variation both as to position, direction, shape, size, and number. Roughly, the spots on the forewing consist of the basal (normal number two), the discoidal lunule, the submedian series (7, very rarely 8), and the marginal series of lunules surmounted by chevrons (7); on the hindwing they consist of the basal (3), the discoidal, the submedian (9), the marginal also surmounted by chevrons (9). The position of the submedian series of forewings usually lies almost midway between the discoidal lunule and marginal series, whilst the direction is generally that of a curve  $\rho$  with spots 1 and 5 furthest towards the centre, and 6 and 7 turned somewhat outwardly, sometimes they are thrown back from the discoidal in an almost straight line against the marginal series (*ab. discreta*, n. ab.), at other times the series is brought quite close to, and with the basal series forms a sort of semicircle around the discoidal lunule (*ab. glomerata*, n. ab.). [Both these forms (*discreta* and *glomerata*) occur in *A. thetis* as well as in *Polyommatus icarus*, *Plebeius argus*, and *Aricia astrarche*, and are commoner in the last-named species than in the others.] Similar modifications occur in the position of the spots on the hindwing. The spots vary in shape and may be rounded, oval, or elongate, the two latter sometimes occurring in the same example; the extreme

elongate forms produce well-defined submedian cuneate streaks, sometimes of considerable length (=ab. *extensa*), and, occasionally, join the discoidal externally, whilst the basal spots in addition may be elongated toward, and join, the discoidal internally, making very complicated striate forms (ab. *striata*, Tutt). The discoidals vary considerably in size and shape, on the forewings from a faint grey obsolete lineation to a large black kidney-shaped, or 8-shaped, spot divided medially by a pale nervure (*discoidalis-duplex*), on the hindwing it may be quite lost in the ground colour in the most albescent forms, whilst in the best developed it may have a well-defined black kernel, although usually a mere white blotch. The basal spots vary considerably, and may consist of 0, 1, 2, 3, or 4, to which forms Courvoisier applies the names *impuncta*, *unipuncta*, type, *tripuncta*, and *quadripuncta* respectively. In the case of the *unipuncta* form, the top or bottom spot may be absent, sometimes a different one on the two wings, in the *tripuncta* it may be the upper or lower one that is duplicated, equally commonly the extension is in the form of a line, so that we get a dot and line (= *elongata*, Courv.) with the dot top or bottom, whilst in the *quadripuncta* form the extension frequently takes on linear development and the spots become a line with two dots or two lines (*bilineata*); the two sides are frequently asymmetrical in the basal spotting. There is considerable difference in the size of the ocellated spots, and, on the whole, those of the ♂s are smaller than those of the ♀s, but this is, in some instances at least, in part due to the ground colour. The spots normally consist of a black kernel surrounded by a fairly wide white ring, conspicuous enough when the ground colour is grey, fuscous, or brown, but lost when the ground colour is white, hence, in the ♂s, from the Trafoithal, and other localities of the albescent, i.e., *pallida*, form, the black spots, robbed of their rings, look quite small, although probably not really less than other specimens whose spots look much larger because of the broad white circles contrasting against the darker ground colour. The spots, however, may be, and frequently are, much reduced in size (usually with some sign of accompanying obsolescence), and these small-spotted forms have been named *parvipuncta*, Rebel; on the other hand, the spots, together with their encircling white rings, may be exceptionally large, when they are known as *crassipuncta*, Courv. South figures (*Ent.*, xx., pl. i., fig. 7) a very finely-spotted ♀ underside, but our ♀ examples from Bourg St. Maurice, Versoix, Fontainebleau, Susa, the Riviera, etc., seem almost or quite as large; indeed, large-spotted ♀s appear to be almost the rule in many localities. Blachier notes (*in litt.*) that, in the Swiss and Savoy specimens, the spots on the forewings are, on the whole, small, and often, because of the pale ground colour, scarcely appear to be surrounded by white; on the hindwings the spots are strongly circled with white, the black kernels relatively small, the white rings relatively wide. Reverdin observes (*in litt.*) that the increase and decrease in size is not always uniform or proportional, and, especially in some cases of *parvipuncta*, the top and two bottom spots often seem to be more reduced proportionally than the others. He further notes that the white rings appear to be more effaced in mountain races, less in those of the plains, but observes that, whilst in specimens from Arolla the rings are almost absent, in those from Bérisal they are well-marked, and whilst those from Brides-les-Bains are well-defined, those from Allevard, at the same

elevation, have none. We believe it will be found, as we have already noted, that the cause of the difference is more likely to be discovered in the geological nature of the ground, coupled with a denseness of the herbage, etc., or the reverse, in the locality, *i.e.*, in the character of the more exposed rocks. Reverdin remarks that he has a ♀ with the spots of the submedian series on the hindwings very small, whilst the white rings surrounding them are abnormally wide, giving the specimen a very special appearance. The variation in the number of spots is fairly extensive, and may be in the direction of increase or decrease. The submedian row of the forewing presents rarely an 8th (apical) spot, but there is occasionally an increase in the number of spots, especially between the submedian and discoidal, the basal and discoidal, or just outside the submedian. These examples are known as *ab. addenda*. On the other hand the number of spots is often considerably reduced (*ab. obsoleta*, Tutt), until in the most extreme forms there are only the discoidal and marginal lunules left = *ab. corydonis*, Bergstr. (*cinnus*, Hb.); beyond this is a form, usually of the *pallida* or albescent underside type, in which the marginal lunules and the discoidals are further reduced almost to obsolescence (*obsoletissima*, n. ab.). It frequently happens that the spots on the hindwings are absent, and those on the forewings normal (= *ab. cinnus*, Gerh.), the form in which the spots on the forewings are absent, and those on the hindwings normal (= *ab. antico-obsoleta*) are rare. Forms in which one or three wings are obsoletely marked and the others normally spotted (*irregularis*, n. ab.) are not uncommon. Forms with the right side obsolete and the left side normal (*dextro-obsoleta*, n. ab.), and others with the left side obsolete and the right normal (*sinistro-obsoleta*, n. ab.), are very rare. Pickett observes (*in litt.*) that, in his collection, out of 51 ♂ and 33 ♀ *obsoleta* (*sens. lat.*), 5 ♂ s and 5 ♀ s are *antico-obsoleta*, 35 ♂ s and 15 ♀ s *cinnus*, Gerh., 4 ♂ s and 4 ♀ s *corydonis*, Bergstr., 3 ♂ s and 6 ♀ s *dextro-obsoleta*, and 4 ♂ s and 3 ♀ s *sinistro-obsoleta*. The *addenda* form is sometimes further modified by the union of the normal and supernumerary spots into striate form. This is particularly the case on the forewings when the normal submedian spots are extended and united to the extra spots to form a series of black linear streaks pointing in the direction of the discoidal (usually without reaching it), the basal spots (the upper particularly) forming a streak (or streaks) in the direction of the discoidal, also usually without touching it (= *ab. juncta*), and this may occur only on the fore- or hindwings (*antico-juncta* and *postico-juncta*) the other wings being normally spotted. In others the direct union of the submedian and basal spots with the discoidal (*ab. striata*, Tutt) shows little trace of the intermediary of supernumerary spots. In other examples, again, only the lower basal and lower submedian spots are joined (= *ab. parisiensis*, Gerh.), occasionally this line is double (*biarcuata*, n. ab.), sometimes the spots approach, without joining (*semi-arcuata*, n. ab.). The union of the first basal and the first submedian spots of the hindwing (= *ab. costajuncta*, Tutt), the third basal and the seventh submedian (= *ab. basijuncta*, Tutt) are also not uncommon. Forms in which *parisiensis*, *costajuncta*, and *basijuncta* are combined are rare (*confluens*, n. ab.). Union of striate and obsolete conditions in the same specimen is not uncommon, *e.g.*, *ab. dolus*, Hb., *ab. antioextensa-obsoleta*, etc. (see *infra*). The modification of the underside margin is most interesting. Normally there are seven marginal

lunules capped with grey chevrons on the forewing, and nine capped with orange and grey chevrons on the hindwing; rarely in the ♂, but usually in the ♀, the lunules on the forewings are also capped with orange; the orange colour in the ♀ is usually deeper-tinted than in the ♂, and may extend from a pale yellow (*flavescens*) to a bright vermilion-red (*rufescens*), the grey chevrons are more marked in the forewing, the orange in the hindwing, in both sexes. In certain of the albescent (*pallida*) form, tending to obsolescence in the spotting, the orange chevrons, extended somewhat wedge-shaped and pointing towards the centre, stand out clearly and separately round the margin of the hindwings against the white ground colour like little jewels in a coronet (*coronetta*, n. ab.), whilst, in others, chiefly also of the albescent form, though also rarely in the paler ♀ forms, the margin is practically obsolete, except for faint grey traces of the chevrons, and this is more marked, as a rule, on the fore- than on the hindwings (*obsolescens*, n. ab.). When the margins are practically absent, and the specimen is also of the extreme obsolete form, we get the ab. *obsoletissima* as already noticed. The colour of the basal scales on the undersides may be blue (typical), green (*chlorescens*), or bronzy (*aurescens*); the most strongly developed examples in this direction belong to the Rivieran races, in some of which the blue (♂) and golden (♀) scales spread over a considerable area, especially at the base of the hindwing. Hodgson possesses three examples (♂ and ♀) with a trace of metallic blue scales in two or three of the marginal spots towards the anal angle of the hindwings (*argenteoquittata*, n. ab.), thus representing the well-known "silver studs" of *Plebeius argus* (*aegon*); Webb observes (*Ent. Rec.*, i., p. 282) that he also possesses *A. coridon* with the marginal spots of the hindwings beneath ocellated with bright scales, and so resembling *Plebeius argus*. The following appear to be the described forms:—

#### MALE ABERRATIONS.

*a. ab. suffusa*, Tutt, "Brit. Butts.," p. 167 (1896); Lamb., "Pap. Belg.," i., p. 240 (1902); Bartel, "Ent. Zeits. Guben," xviii., p. 115 (1904); Griebel, "Lep. Faun. Bay. Rheinpfalz," i., p. 16 (1909); Seitz, "Gross-Schmett.," i., p. 315 (1909); Rebel, "Berge's Schmett.," 9th ed., p. 72 (1909). *Corydon* ab., Hodgs., "Proc. Sth. Lond. Ent. Soc.," p. 87 (1906).—♂. Ground colour of a dark suffused hue (Tutt).

This is a form in which the ground colour itself is darkened by general suffusion producing a brownish, drab or grey tint, sometimes with a definite trace of the ordinary ground colour, and sometimes entirely devoid thereof, according to the degree of suffusion. The margin is normal, and the ground colour dark quite independently of any spread of the dark margin over the wing. The type of *suffusa* was taken at Canterbury in August, 1892; it is of a drab or brownish colour to the naked eye; under a lens the brownish ground colour is seen to be due to a covering of small blackish scales, the blue being restricted to the basal portions of the costa and inner margin of the forewing, and the inner margin and inner edge of the marginal ocellar area of the hindwing; left wings rather bluer than the right. The marginal spots of the forewings are of the drab ground colour and edged internally with whitish, those of the hindwings are darker, and edged externally with whitish. Owing to the thinness of the scaling, the darker suffused ground colour is accompanied by a distinct trace of

the spotting of the underside through the wing, so as to be seen from the upperside. Other examples (*subsuffusa*) have a similar patch, suffusedly semitransparent, roughly triangular, extending from the discoidal near the costa towards the apex, then down inside the marginal band and nearly to anal angle, then sharply back to just within discoidal again. It is strangely almost the same area that is so well-marked with black scales in *ab. marginata*, but the development of the two forms is entirely different, the one (*subsuffusa*) largely due to failure in the normal scaling, and the other (*marginata*) to a great excess of the normal scaling, or rather a spread of the black marginal scaling over the ground colour of this portion of the wing. Three specimens in the British Museum coll., strongly suffused with grey, appear to be *suffusa* (1) a small ♂ (labelled "England, Harper"), (2) a large ♂ ("Folkestone, Bates' coll."), (3) another large ♂ ("? Holland, *apennina*, ex Staud."), but with no resemblance to Zeller's two specimens of *apennina* just above them. They are nearer (but yet very far from) the greyest of the Hyères (var. *meridionalis*) examples, being strongly suffused with grey, and having the appearance of having been damped; in reality they are sparingly scaled with black, more particularly on the outer part of the wing beyond the discoidal lunule, the basal area more normal; both the larger examples have discoidal spots on the forewings. Hodgson has a ♂, from the Dover district, of a drab colour, with a suspicion of bluish at the bases of the wings, and indistinct discoidals to the forewings, the underside being very brown for a ♂ and well spotted. Another ♂ in the same coll., also from Dover, is almost dove-grey, with a narrow marginal border and fringes quite white; the underside has also a very suffused dull appearance, the spots appearing blurred (as if washed). Griebel notes a specimen taken at Speyer in the Palatinate together with transitional forms.

β. *ab. plumbescens*, Tutt, "Proc. Ent. Soc. Lond.," p. lxxx (1909).—A leaden-coloured ♂, in which the discoidal lunules of the forewings are well-marked, apparently an extreme form of the *suffusa* series, captured at Jaca (on the Spanish side of the Pyrenees) by Dr. M. Burr, June 10th, 1904.

γ. *ab. albescens*, Ckll., "Proc. Sth. Lond. Ent. Soc.," p. 99 (1887). ? *Apennina*; Shipp, "Ent. Rec.," v., p. 98 (1894); Tutt, "Ent. Rec.," v., p. 160 (1894).—The metallic colour replaced by white (Cockerell).

Just what Cockerell had in his mind, when he used this name it is difficult to say. Two British examples have been recorded that may belong here. The first is noted by Shipp as "a singular example from Bournemouth approaching the var. *apennina*, Zell., in which the light bluish colour had altogether faded to a whitish tint, but the markings on the underside, though very indistinct are, nevertheless, well defined." The other is in our own British coll., and is recorded as "a pale *ab.* of *A. corydon*, captured at Cuxton, in July, 1886, and probably to be referred either to *apennina* or *albicans*." It is, of course, nothing like either, but satisfies Cockerell's definition very well, and appears not to show any pathological tendencies. Gauckler states that he took a transition to var. *albicans*, Hüb. (!), on the Michaelsberg near Bruchsal, on August 18th, 1901; this, too, may belong here, though from a remark like this one cannot judge. One wonders also what the males are like that Norris obtained from the Certosa di Pesio in July and August, 1892, and described as being "very white above." Here should probably be referred, also, a specimen taken by Lowe at Bormio on

July 19th, 1903, among other specimens which were perfectly normal; Wheeler notes (*in litt.*) that it is very pale in colour, without the slightest greenish tint, with a fairly broad fuscous marginal band on the forewing, the hindwing having only a row of fuscous spots, obsolescent at each end, and bordered outwardly with whitish; the white hair-scales are fairly numerous; the underside has smallish spots on the forewings and very minute ones on the hindwings, and the marginal spots on both pairs are merely indicated in pale yellowish; otherwise all the spots, including the basal, are present.

♂. ab. *fowleri*, South, "Ent.," xxxiii., p. 104, pl. iii., figs. 4-5 (1900); Leonh., "Ent. Zeits. Guben," xviii., p. 54, fig. 2 (1904); "Ins. Börse," xxii., p. 124 (1904); Bartel, "Ent. Zeits. Guben," xviii., p. 115 (1904); Bellamy, "Proc. Sth. Lond. Ent. Soc.," p. 109 (1905); South, "Brit. Butts.," p. 168 (1906); Seitz, "Gross-Schmett.," p. 315 (1909); Rebel, "Berge's Schmett.," 9th ed., p. 72 (1909). *Corydon* ab., ? Tunaley, "Proc. Sth. Lond. Ent. Soc.," p. 62 (1895); Sladen, "Ent.," xxx., p. 81 (1897); Fowler, "Ent.," xxxii., p. 269 (1899); Sladen, "Ent.," xxxv., p. 273 (1902); Butler, "Proc. Sth. Lond. Ent. Soc.," p. 44 (1906); Pickett, *loc. cit.*, p. 47 (1906). — Mr. J. H. Fowler recorded (*Ent.*, xxxii., p. 269) the capture on the Dorset coast, in 1899, of some forms of *L. corydon*. As the descriptions of these aberrations did not accord with any modification of the species with which I was acquainted, I wrote to him about them. In reply he most kindly sent me a fine series for examination, and for this courtesy I am very greatly obliged to him, as I am thereby enabled to have figured an exceedingly interesting form of *L. corydon*. The male examples with orange markings on the outer margin of the hindwings are curious, but the most striking form is that represented by figures 4 and 5 on plate iii. In this form, of which there are six males and one female in the series, the remarkable feature is that the border of the outer margin is white instead of the usual black; the inner limit of this border is, on the forewings, defined by a dusky shade, and the black nervules break up the border into six spots; on the hindwings four or five of the white spots are centred with black dots. Three other male examples and two females exhibit gradations between the form figured and the typical *L. corydon* (South).

As diagnosed by South, the special feature of the ♂s and ♀s of this form, is that the marginal border of all the wings is white, broken up by the dark nervules into a series of white spots, bordered with dusky internally, and each containing on the hindwings a black dot. Sladen appears (*Ent.*, xxx., p. 81) to have been the first entomologist to observe this aberration, noting that, near Devizes, in August, 1896, he took "a ♂ with the hindmarginal band white, the black veins running through it to the fringe," unless Tunaley's ♂, captured at Freshwater, and described (*Proc. Sth. Lond. Ent. Soc.*, 1895, p. 62) as having "the black border entirely ab-ent on all the wings," is referable here. Fowler, in 1899, records (*Ent.*, xxxii., p. 269) the capture of several ♂s and two ♀s (at Swanage), and says that he has taken many examples approaching this form both at Dover and near Blandford, but not to be compared with the above. Bellamy notes (*op. cit.*, 1905, p. 109) the capture of a very fine specimen at Swanage, on July 20th, 1899, showing an almost total absence of spots in the white border of the hindwings. Jane records its capture on August 5th, 1907, at Swanage. Leonhardt observes that Riedinger took a specimen in the Schwanheim Forest, near Frankfurt-on-Main, in August, 1900, and further states that he himself took two transitional specimens at Hünigen, in Upper Alsace, in August, 1903. Gillmer notes (*in litt.*) the capture of a ♂ on the Mühlberg, near Krüchern, in the district of Cöthen, Anhalt.

ε. ab. (? et var.) *apennina*, Zell., "Isis," pp. 148-9 (1847); Heydrch., "Lep.



Eur. Cat.," p. 14 (1851); Staud., "Cat.," 1st ed., p. 6 (1851); Staud., "Cat.," 2nd ed., p. 12 (1871); Rühl, "Pal. Gross-Schmett.," p. 278 (1893); Tutt, "Brit. Butts.," p. 166 (1896); Staud., "Cat.," 3rd ed., p. 86 (1901); Stef., "Bull. Soc. Ent. It.," xxxii., p. 339 (1901); Spuler, "Schmett. Eur.," 3rd ed., i., p. 66 (1902); Lamb., "Pap. Belg.," p. 239 (1902); Bartel, "Ent. Zeits. Guben," xviii., p. 117 (1904); Leonh., "Ins. Börse," xxii., p. 124 (1905); Verity, "Bull. Soc. Ent. Ital.," xxxviii., p. 28 (1906); Seitz, "Gross-Schmett.," i., p. 315 (1909); Rebel, "Berge's Schmett.," 9th ed., p. 72 (1909). *Apenninus*, Kirby, "Syn. Cat.," p. 368 (1871). *Apennina*, Lang, "Butts. Eur.," p. 122 (1884); Kane, "Eur. Butts.," p. 45 (1885). *Hispana*, Tutt, "Brit. Butts.," p. 167 (1896); Grover, "Ent. Rec.," ix., p. 312 (1897); Wheeler, "Butts. Switz.," p. 31 (1903). *Corydon* ab. ? Mosl., "Nat. Journ.," v., suppl., p. 10, pl. iv., fig. 5 (1896); Hodgson, "Proc. Sth. Lond. Ent. Soc.," p. 87 (1906). *Limbomaculata*, Schultz, "Jahresb. Wien. Ent. Ver.," xvi., p. 76 (1906).—Var. *apennina*; alarum marginibus angustis cinerascens, alis subtus dilutissimis. I only saw two ♂s on September 15th, behind Fuligno, in the Apennines, where they flew higher than *adonis* on the calcareous rocks, and settled on white-felted *Labiatae*. They looked very different from ordinary *corydon*, but were recognised as such by the extensive pubescence on the wings. They are among the smallest specimens. The silvery-blue of the ground colour is of a whiter tint in one than in the other. The nervures of the upperside are, in both, blackish for a short distance. The outer margin of the forewing is grey rather than blackish, much narrower than usual, and contains a row of whitish obsolete interneural spots on the hindwings, the grey shade is wanting on the inner side of the row of spots which are bordered outwardly with white between the nervures. Only very slender grey streaks run from the nervures into the pure white fringes. The ground colour of the underside is much mixed with white, that of the forewings appearing whitish and of the hindwings whitish-brown. The spots are small and obsolete, and their white margins scarcely visible; the reddish-yellow of the marginal chevrons is faint and pale. The fringes have slender grey longitudinal dashes. I suspect that this is the variety of *corydon* of which Graslin (*Ann. Soc. Ent. France*, v., p. 555) remarks: "*Dorylus* and *corydon* have their colours strangely affected by climate, in the high hills near Granada, the great heat making them almost white, while, on the peaks of the Sierra Nevada, where they experience a moderate temperature, their colour remains unaltered." But it seems to me that it is rather the effect of a calcareous soil, for the place where I found *corydon* in the Apennines was very fairly high (Zeller).

Zeller's two types described above are in the British Museum coll., and carry his labels, "Fuligno, 5. ix. 44, Z., 'Is.' 1847, 148," one example somewhat broken. Both are 38mm. in expanse. They are almost typical silvery-blue ♂s, but have rather pale margins to the forewings, the margins broken up into white-edged, grey-centred spots, whilst the marginal spots of the hindwing are white-edged, black-centred ones, the margin being rather more complete. Two ♂s labelled "Greece, Merlin coll.," are very similar, as also is one from "Riva, 2000ft., 30. vii. '92 (Elwes)." The types are of fair average size—38 mm.—and very similar to examples that may be taken every year in Britain. Stefanelli speaks (*Bull. Ent. Soc. It.*, xxxii., pp. 339-40) of it as replacing the type at Boscolungo, and perhaps throughout the heights of the Tuscan Apennines, whilst Verity says (*Bull. Ent. Soc. Ital.*, xxxviii., p. 28) that this form is pretty frequent at the end of August and in September, especially on the hills that crown the Consuma Pass in the Vallombrosa. But the ab. *apennina*, as represented by Zeller's types, is not the normal form of the Apennines, which is practically the same as those of Britain, France, or Switzerland, *e.g.*, Wheeler notes (*in litt.*) that his *A. coridon* from Assisi, taken, however, at no great altitude, are practically indistinguishable from those captured at Guildford in Surrey, though slightly bluer in tint, and adds that the only specimen he has corresponding with Zeller's types, came from Eclépens. The fact must be added that,



when we wrote our little volume on *British Butterflies*, in 1896, we neither knew Zeller's description, nor had we examined his types. Further, we had no knowledge of *hispana*, except from the erroneous diagnosis in Staudinger's *Catalog*, 2nd ed., p. 12, and it happens that the examples that we chose to represent our *hispana*, bear no resemblance to the true *hispana*, but are the picked examples of many British captured individuals, that most closely resemble Zeller's types of *apennina*. They resemble them in the pale silvery-blue ground colour, in the pale outer margins of the forewings, in the pale-edged, grey-centred, interneural marginal spots in this pale marginal area, as well as in the rather better defined marginal spots on the hindwings. On the underside, too, they are very similar, and when Zeller described his types as pale, it was only by comparison with some much darker type that he carried in his mind. As a matter of fact the undersides are not paler than those from many other districts, not so pale, for example, as the albescent forms from such distant localities as the Trafoi-thal and the Véneon Valley (Bourg d'Oisans). This evidently misled Schultz who states (*Jahresb. Wien. Ent. Ver.*, xvi., p. 76) that his "*limbomaculata* only differs from *apennina* in the fact that the underside agrees entirely with the type," which is quite exactly what Zeller's types of *apennina* do. It will be gathered from this, therefore, that the name *apennina* is somewhat of a misnomer, inasmuch as the types do not represent a varietal race, but merely two pale examples, occurring on ground where more typical forms are also found. It is merely an aberration, and may be taken occasionally anywhere with other quite different forms. Weiler states (*Schmett. Innsb.*, p. 9) that specimens strongly approaching *apennina* are met with in the Tirol, and Neustetter's description of *altica* (*Int. Ent. Zeits. Guben*, iii., p. 198) also appears to refer to specimens approaching or agreeing with this form.

♂. *ab. punctata*, Tutt, "Brit. Butts.," p. 167 (1896); Lamb., "Pap. Belg.," p. 239 (1902); Bartel, "Ent. Zeits. Guben," xviii., p. 115 (1904); Haverk., "Ann. Soc. Ent. Belg.," i., p. 156 (1906); Lamb., "Cat. Léop. Belg.," p. 427 (1907); Seitz, "Gross-Schmett.," p. 315 (1909); Rebel, "Berge's Schmett.," 9th ed., p. 72 (1909). *Corydon ab.*, South, "Proc. Sth. Lond. Ent. Soc.," p. 70 (1886); "Ent.," xx., p. 2, pl. i., fig. 9 (1887).—♂. Bright silvery-blue in colour, with interneural marginal spots to fore- and hindwings (Tutt).

In our very bright blue ♂s, it occasionally happens that the margin of the forewing has no definite black border, but, instead, the series of interneural spots, usually almost lost in the dark border, stands out nearly as clearly as those of the hindwing, with little or no failure in the intensity of colour, and almost as strongly bordered; specimens of this form, with the margins of the forewings ornamented with ocellated spots similar to those of the hindwings, comprise our *punctata*. It is fairly abundant on the Kentish downs—Halling, etc.—and South notes it as frequent at Ventnor. Wheeler notes that Barrett gives (*Lep. Brit.*, i., pl. xii., fig. 1f) a ♂ with spots showing in the band, fore- and hindwing. Aigner-Abafi reports it from Budapest and Isaszegh; ♂ specimens in which the marginal bands of forewings are practically obsolete and the marginal spots clearly distinct, occur at Digne (Rowland-Brown); Haverkamp records it from Torgny in Belgium.

♀. *ab. caeruleo marginata*, Tutt, "Brit. Butts.," p. 167 (1896); "Ent. Rec.," ix., p. 80 (1897); Grover, "Ent. Rec.," ix., p. 312 (1897); Lamb., "Pap. Belg.," p. 239 (1902); Bartel, "Ent. Zeits. Guben," xviii., p. 115 (1904); Seitz, "Gross-

Schmett., "i., p. 316 (1909); Rebel, "Berge's Schmett.," 9th ed., p. 72 (1909). *Corydon* var., Barr., "Lep. Brit. Is.," i., pl. xii., fig. 1b (1893); ? Mosley, "Nat. Journ.," v., supp., p. 10, pl. iv., fig. 8 (1896).—♂. Ground colour silvery-blue, with broad dark unspotted marginal bands (Tutt).

This is the opposite form to *punctata*, for, whereas in the latter the forewings carry on, as it were, the interneural ocellations normal on the hindwings, in this form the forewing has a broad black unspotted margin, whilst the hindwings may have the normal ocellations partially obliterated, and their position partly occupied by a dark marginal band that tends to absorb them, so that both fore- and hindwings are somewhat similarly marked with a dark marginal band. The form is not uncommon in most British localities for this species—Cuxton, Dover, etc. It also occurs frequently abroad, e.g., France—Bourg d'Oisans, etc.; Hungary—Budapest and Isaszegh (Aigner-Abafi), etc.

♂. ab. (*et* var.) *marginata*, Tutt, "Brit. Butts.," p. 166 (1896); "Ent. Rec.," ix., p. 80 (1897); Grover, "Ent. Rec.," ix., p. 312 (1897); Lamb., "Pap. Belg.," p. 239 (1902); Bartel, "Ent. Zeits. Guben," xviii., p. 115 (1904); Haverk., "Ann. Soc. Ent. Belg.," i., p. 156 (1906); Lamb., "Cat. Léop. Belg.," p. 427 (1907); Grund., "Int. Ent. Zeits. Guben," ii., p. 87 (1908); Seitz, "Gross-Schmett.," i., p. 315 (1909); Tutt, "Ent. Rec.," xxi., p. 300 (1909). *Corydon* var.  $\gamma$ , Stphs., "Illus. Haust.," i., p. 89 (1828). *Corydon* var., South, "Ent.," xx., pp. 2, 49 (1887); Weir, "Ent.," xx., p. 265 (1887); Obth., "Etudes," xx., pl. iii., fig. 32 (1896); Courv., "Soc. Ent.," xii., p. 26 (1897); Buckstone, "Proc. Sth. Lond. Ent. Soc.," p. 109 (1899); Pickett, "Proc. Sth. Lond. Ent. Soc.," p. 114 (1902); Leonh., "Ins. Börse," xxii., p. 124 (1905). *Nigrocostalis*, Schultz, "Jahresb. d. Wien. Ent. Ver.," xvi., p. 77 (1905); Rebel, "Berge's Schmett.," 9th ed., p. 72 (1909). *Seminigra*, Preissck., "Verh. z.-b. Ges. Wien," lvii., p. 87 (1906); Rebel, "Berge's Schmett.," 9th ed., p. 72 (1909). *Borussia*, Dadd, "Berl. Ent. Zeits.," liv., p. 36 (1909); Linst., *op. cit.*, p. 237 (1909); Gillmer, "Ent. Rec.," xxi., p. 261 (1909).—♂. With a distinct broad, darker border to forewings, and interneural spots on hindwings (Tutt).

This is a rather striking form of this species. The interneural spots on the hindwings are sometimes faint, but usually large and well developed, on the forewings they are lost in a wide black border, which is increased strongly towards the costa in the form of dark shading, reaching to, or almost to, the discoidal lunule, which is sometimes distinctly marked. It must not be confused with the type (also a wide-margined form, described from Croatian examples [Gratz] by Poda, as having a "black marginal fascia," in which, however, the margin is cut sharply off from the ground colour, and not somewhat suffused on its borders as is the case in *marginata*. It occurs somewhat rarely in western Europe, England, France, Italy, Switzerland, etc., but becomes almost racial in certain parts of Germany, Austria, Bosnia, etc. In Britain it occurs as a rare aberration at Dover, Cuxton, Eastbourne, Ventnor, etc., and Buckstone notes a ♂ with the borders of the forewings darker and broader than usual, taken at Sevenoaks in August, 1897. Oberthür figures an example from Vernet-les-Bains, in his *Etudes*, xx., pl. iii., fig. 32. Courvoisier records (*Soc. Ent.*, xii., p. 26) the capture of a ♂ on the Simplon in 1895 with almost a half of the forewings forming a dark band. Lowe states (*in litt.*) that near Chur, at the foot of the Mittenberg, on August 2nd, 1895, *A. coridon* was plentiful, beautifully fresh, large, unusually dark-bordered and with dark suffusion on the disc of the forewings; that with this noticeably fine, newly-emerged race were smaller *A. coridon*, of a light pale colour, with very narrow border to the forewings and very worn. In the Dolomite region of the Tyrol, we observed a much

larger proportion to be of this form, whilst Grund observes (*Ent. Zeits. Guben*, ii., p. 87) that the species is very common at Samobor, scarcer at Podsused, the black border generally very broad, the ♂s at the first-mentioned locality often of the ab. *marginata*, Tutt, with a remarkably strongly developed row of marginal spots on the hindwings. Bartel records (*Ent. Zeits. Guben*, xviii., p. 115) this form from Rakovica in Upper Carinthia, July 23rd, 1896, by Hafner, and correctly refers Oberthür's fig. 32 hereto. We have some excellent examples from Igman, and there are others labelled "Bosnia—Buerda (Nicholl)" in the British Museum coll., but the finest examples that have come under our notice are those in the British Museum coll., labelled "Mutzell coll., Germany." They are, on the whole, of large size, varying from 44mm. to 42mm., and one supposes are identical with those that Dadd states are racial in the Berlin district, and recently described (*Berl. Ent. Zeits.*, liv., p. 36) under the name *borussia*. Weir observes (*Ent.*, xx., p. 265) that, near Aussig in Bohemia, the species occurs among the darkest trap rocks, that the ♂s are larger and darker than the English, the outer third of the forewings more suffused with black. South observes (*Ent.*, xx., p. 49) that the Magdeburg ♂s have exceedingly broad black marginal borders, the costa also broadly streaked with blackish, and Leonhardt records (*Ins. Börse*, xxii., p. 124) the same form from Oppeln in Upper Silesia. It appears to be the *seminigra* of Priessecker, who diagnoses it (*Verh. z.-b. Ges. Wien*, lvii, p. 87) as "Alis anterioribus margine exteriori (fere) usque ad finem cellulæ nigro," from two ♂s taken at Wippach, in southwest Carniola, on August 5th, 1905; and states that there is another in the "Hofmuseum," taken on September 3rd, 1892, on the Hochlantsch near Frohnleiten in Styria. It appears also to be Schultz' *nigricostalis*, which he describes (*Jahresb. Wien. Ent. Ver.*, xvi., p. 76) as having the costal area coloured black as far as the middle, the dark margin of the hindwing being also broadly shaded with black. He further records (*op. cit.*) another ♂ with the marginal border so broad that the blue is confined to the basal half of the wing. Pfitzner notes (*Iris Dresd.*, 1901, p. 94) the capture of a ♂ at Nonnenbusch, in Silesia, with the marginal fascia of the forewings extended over the greater part of the wings, more completely on the right than on the left side, the silvery-grey colour only being preserved as a weak dusting of scales; a somewhat similar ♂ is figured by Mosley (*Nat. Journal*, 1896, pl. iv., fig. 6) from the "Webb coll." This form, in which the band so largely overspreads the wings, must not be confounded with ab. *suffusa*, which is the result of a mere uniform darkening of the ground colour. These extreme forms, in which the margin extends beyond the discoidal cell and middle of the wing towards the base, might well be grouped as ab. *melaina*, n. ab. Dadd's observations of this *marginata* form under the name of *borussia*, as it occurs in the Berlin district and at Osterode in East Prussia, read (*Berl. Ent. Zeit.*, liv., p. 36) as follows:—

The ♂s are decidedly larger than the type; the black border decidedly broader, taking up almost a third of the wing, so that the insect has a darker appearance, though the blue is quite like that of the type; the ♀s do not differ from the type on the upperside, but the underside of both sexes of *borussia* is distinctly darker than that of the type, that of the ♂s somewhat brown, of the ♀s dark brown. Even when typical *coridon* have a brown underside the darker coloration of

*borussia* shows strikingly if long series of the two are placed side by side. It is the form of the Berlin district, and also that of Osterode in East Prussia.

It happens that the Croatian *coridon* (probably Poda's locality) is often of this particular form (*teste* Grund), and the comparison, therefore, with the "type" requires careful consideration.

α. *ab. torgniensis*, Haverkamp, "Ann. Soc. Ent. Belg.," 1., p. 157 (1906); Lamb., "Cat. Léop. Belg.," p. 428 (1907). *Corydon* ab., South, "Proc. Sth. Lond. Ent. Soc.," p. 53 (1887); Sladen, "Ent.," xxx., p. 81 (1897).—A ♂ of the normal colour; it is known that the ♂ has no spots upon the wings, but that the ♀ has always the discoidal spot, sometimes very strongly marked. I now possess a ♂ of normal coloration, but which equally shows this spot, and, if the typical colour of *coridon* were not present, one might suppose that some other species was in question. I call this new aberration which was found on August 21st, at Torgny, *ab. torgniensis* (Haverkamp).

This is the well-known aberration in which the discoidal lunules of the forewings are indicated in the ♂. Haverkamp appears to have described it, from a single Belgian example, as a very rare aberration. It is not at all uncommon in some districts of Britain and the Continent, but is rarer in others; bleak exposed districts, with a tendency to the development of ♂s with a less bright colour than usual, being more than usually productive of this peculiarity (see *antea*, p. 10). Sladen notes them as being fairly common in the Devizes district, and we have examples from several localities both in England and on the Continent. The *abs. minor*, taken near the South Foreland in August, 1887, show several of the *torgniensis* form; they also show a pale shade on the hindwing, in the position of the discoidal lunule (Tutt). Wheeler observes that he has this form from Guildford and from Assisi, and it is almost racial in the spring brood on the French Riviera. Two of the large *marginata* examples in the British Museum coll. are markedly of this form.

κ. *ab. suavis*, Schultz, "Ent. Zeits. Guben," xviii., p. 93 (1904); Bartel, "Ent. Zeits. Guben," xviii., p. 115 (1904); Seitz, "Gross-Schmett.," i., p. 315 (1909); Rebel, "Berge's Schmett.," 9th ed., p. 72 (1909). *Corydon* ab., Meyer-Dür, "Schmett. Schweiz," p. 86 (1852); South, "Ent.," xxxiii., p. 104 (1900); Sladen, "Ent.," xxxv., p. 273 (1902). *Corydon*, Neust. and Korn., "Schmett. Schles.," pl. xxi., figs. 69a-c (1842). *Aurantia*, Wheeler, "Butts. Switz.," p. 31 (1903).—*Alis posticis supra rufomaculatis*. On the upperside of the hindwings there are, in many ♂s of this species, reddish-yellow spots on the inner edge of the black marginal spots, and in front of them, little black lunules, which are wanting in the type. The reddish-yellow spots are seldom to be seen over all the black marginal spots, generally only in cells 2 and 3. Silesia—Hertwigsdorf, Hertwigswaldau, Oppeln; Bavaria—Würzburg, Kitzingen; Upper Alsace—Hünningen. In Switzerland (*teste* Wheeler) not scarce; at Esino about 20 per cent. Wheeler is disposed to regard this as the ♂ form of *ab. aurantia*, Tutt. This opinion, however, appears risky, and it is striking that, at the places where *ab. suavis* occurs, *ab. aurantia* was not found, nor is the opposite the case (Schultz).

The form is uncommon in Britain, but occurs on the Dorset coast, near Swanage, etc., in Surrey at Reigate, in Sussex in the Brighton district, in Kent on the Halling downs, Dover, etc. It was noted by Meyer-Dür, in 1852, as occurring in the Valais, and as being specially common at Sion and Grengiols. Wheeler noted it as not infrequent in Switzerland. Rowland-Brown observes that the ♂s taken near Mende, Lozère, are similar to those taken at Esino, near Varenna, by Miss Fountaine, and belong to the form in which the orange spots surmounting the hindwing marginal ocellations are strongly marked.

Specimens in the British Museum coll. from Florence (May 3rd, Stefanelli), Saas-Thal (Godman), are similarly marked; the most strongly marked is one labelled, "Mutzell coll. Berlin," and corresponding otherwise with *ab. marginata*, Tutt; others more slightly marked are labelled Eggenthal (Hampson), Esino (Elwes), Britain (Stevens), Pegli and Kokalény. Aigner-Abafi reports it from Budapest and Isaszegh. Neustadt and Kornatzki, in their *Schmetterlinge Schlesiens*, figure what they evidently regard as typical ♂ *coridon*, with very strongly marked orange chevrons, pl. xxi., figs. 69a and c.

λ. *ab. (? et var.) graeca*, Rühl, "Pal. Gross-Schmett.," p. 763 (1895); Courv., "Soc. Ent.," xii., p. 26 (1897); Lamb., "Pap. Belg.," p. 239 (1902); Bartel, "Ent. Zeits. Gub.," xviii., p. 117 (1904); Seitz, "Gross-Schmett.," i., p. 315 (1909).—Allied very closely to var. *apennina*. ♂ with paler upperside and strong greenish-silver gloss; forewings with blackish-grey border without white spots. Underside very washed out, even more so than in var. *apennina* (Rühl).

This seems a most unfortunate cognomen, and apparently Rühl has given a racial name to an odd ♂ in his possession, for in no particular does his description show any approach to Zeller's *apennina*. These latter are silvery-blue, not "silvery-green," their chief character is the pale, spotted margin of forewings, not "blackish-grey unspotted," whilst the underside spotting in *apennina* is almost typical, and not "washed-out." [Zeller, by-the-bye, must have had some remarkably strongly-spotted specimens with which to compare when he was writing his description of *apennina*.] Strangely, the only two ♂ specimens in the British Museum coll. from Greece, labelled "Merlin coll.," are almost identical with Zeller's *apennina*, and disagree in almost every particular with Rühl's description of *graeca*. In the present state of our ignorance, Rühl's description is not applicable racially to the known Greek examples. Courvoisier notes taking an example on the Simplon Pass, in 1895, that came near *graeca*. Bartel mentions a ♂ in his collection belonging to *graeca*, the underside being of the *parisiensis* form.

μ. *ab. glabrata*, n. *ab.*—All the wings pale blue, but with a peculiar smooth appearance [almost as if slightly greased]; this appearance being due to the absence of the long white hair-scales which characterise the species.

Two striking ♂s in the British Museum coll. are of this form—(1) Blue-grey in tint, very smooth in appearance, strong marginal border to forewings; the hindwings also with a strong border, showing traces only of the three lower interneural spots, labelled "Spain, Leech coll." It is very different from any of the Spanish local forms described (*postea*) and one suspects that it must have come from northern Spain where the species is more typical in appearance. (2) A slightly larger example, labelled "Eggenthal, July, 1906, Hampson," only differs in having traces of the whole row of interneural spots on the outer margin of the hindwings. We have very similar examples in our own collection.

ν. *ab. transparens*, Rebel, "Berge's Schmett.," 9th ed., p. 72 (1909).—The spots of the underside showing through on the upperside. Both sexes.

ξ. *ab. metagrapha*, Spannert, "Wiss. Benen. Eur. Gross-Schmett.," p. 29 (1888).—Distinguished by its aberrant colouring and marking (Spannert).

This name comes from a book which is merely a list of names with their meaning, and does not originate any names at all, nor give the authors from whom they are taken. We have so far been quite unable to trace its origin.

## MALE AND FEMALE ABERRATIONS.

*a. ab. minor*, Ckll., "Ent.," xxii., p. 176 (1889); Tutt, "Brit. Butts.," p. 167 (1896); Ckll., "Ent. Rec.," ix., p. 331 (1897); Lamb., "Pap. Belg.," p. 240 (1902); Bartel, "Ent. Zeits. Guben," xviii., p. 115 (1904); Lamb., "Cat. Léop. Belg.," p. 423 (1907). *Corydon* ab., Gush, "Ent.," xx., 265 (1887); Tutt, "Ent.," xx., p. 323 (1887); Briggs, "Proc. Sth. Lond. Ent. Soc.," p. 80 (1887); Ashby, "Proc. Sth. Lond. Ent. Soc.," p. 108 (1898); Wheeler, "Ent. Rec.," xvi., p. 16 (1904); Pickett, "Proc. Sth. Lond. Ent. Soc.," p. 114 (1902).—While collecting with a friend on the chalk downs between Lewes and Glynde, we met with a great profusion of both ♂ and ♀ specimens of this butterfly of unusually dwarfed size. Most of the specimens were less in size than *Lycuena icarus*. They appeared to be confined to a small spot just by the rifle-butts, for, although we saw hundreds on the downs outside this particular spot, they were all of the normal size (Gush, *Ent.*, xx., p. 265).

This form was named by Cockerell in 1889, without description, but with reference to *Ent.*, xx., p. 265, on which the above note appears. These small specimens used to be, and still are, in both sexes, exceedingly abundant on the piece of coast near the South Foreland light-house on the Dover side. Just here, the foodplant grows very sparsely on the exposed cliffs, and we suggested (*Ent.*, xx., p. 323) that insufficient or not sufficiently nutritious food in the larval stage was probably the cause of the frequency of dwarf examples in this restricted area. Wheeler suggests that the same cause probably accounts for the very diminutive size of all the specimens taken and seen by him on a steep shaly slope of the Dent du Midi between Champéry and Barmaz, and mentioned in the *Ent. Rec.*, xvi., p. 16. But they occur occasionally in many places with the type, possibly the result of the larvæ being badly placed, not only in most British localities, but also on the Continent. Cruttwell notes the species in countless thousands at Watlington, in August, 1902, all very small, some under an inch, and sometimes so inert that they allowed themselves to be trodden upon. Some very small examples were taken at Clelles during the first few days of August, 1906. Edgell records a ♂ only 25mm. in expanse, from the Lewes district, Ashby a very tiny one at Riddlesdown, Pickett many from the Dover district, and we have already made many other references (see *antea* pp. 15-16) to the occurrence of small examples of this species.

*β. ab. pallida*, Tutt, "Brit. Butts.," p. 167 (1896); Wheel., "Butts. Switz.," p. 32 (1903); Bartel, "Ent. Zeits. Gub.," xviii., p. 115 (1904); Seitz, "Gross-Schmett.," i., p. 315 (1909); Rebel, "Berge's Schmett.," 9th ed., p. 72 (1909). *Corydon* ab. b., Meyer-Dür, "Schmett. Schweiz," p. 86 (1852).—Underside white in ♂, pale ochreous in ♀ (Tutt).

There is considerable difference in the colour of the underside of the wings, and we have already dealt at length with the different forms including *pallida* (see *antea* p. 16). Meyer-Dür observes that, in the specimens from the Valais and the Bernese Oberland, "the underside is much paler (*i.e.*, than in examples from Wittenburg), not light brown on the hindwing like the North German examples, but quite pale like the South European *albicans* and *osmar*." Wheeler says that this is in accordance with his experience, almost all Swiss specimens that he has seen having pale undersides in the ♂, though not so pale as in the Spanish *albicans*: the ♀s, however, often have the underside very brown, though pale ones are not uncommon.

## FEMALE FORMS.

*α. ab. albicincta*, Tutt, "Brit. Butts.," p. 167 (1896); Lamb., "Pap. Belg.," p. 240 (1902); Bartel, "Ent. Zeits. Gub.," xviii., p. 115 (1904); Haverk., "Ann. Soc. Ent. Belg.," i., p. 156 (1906); Lamb., "Cat. Léop. Belg.," p. 427 (1907); Rebel, "Berge's Schmett.," 9th ed., p. 72 (1909). *Corydon* var., Stephs., "Illus. Haust.," i., var. *β*, p. 89 (1828); Meyer-Dür, "Schmett. Schweiz.," p. 86 (1852); Slad., "Ent.," xxv., p. 274 (1902); South, "Brit. Butts.," pl. 109, fig. 6 (1906); Trautm., "Int. Ent. Zeits. Guben.," p. 162 (1908). *Corydon*, Neust. and Korn., "Schmett. Schles.," pl. xxi., fig. 69e (1842).—With discoidal spots edged with white, often with streaks of blue on hindwings (Tutt).

This is a not uncommon form of the ♀ in which the discoidal spots of the forewings are ringed with white; more rarely the discoidal of the hindwings are also similarly ringed, or are replaced by tiny white spots, so that all four discoidals stand out conspicuously (= *ab. albipuncta*). In its further development the rings and spots may be blue (*caeruleocincta* and *caeruleopuncta*). Stephens' definition is: "Above brown with a blue disc, and a whitish discoidal dot with a black pupil; beneath, the posterior wings have a discoidal white-cinctured crescent with a waved band of seven undulated spots towards the hinder margin." Meyer-Dür, in 1852, noted examples from Alpbach near Meyringen, with a white discoidal spot on the upperside of each wing (*albipuncta*). Keynes notes (*Ent. Rec.*, xviii., p. 240) the capture of a specimen August 4th, 1905, in the Pfynwald, with the discoidals of the forewings conspicuously ringed with white, and a conspicuous white spot on the upperside of the hindwings. Trautmann records (*Int. Ent. Zeits. Gub.*, ii., p. 162) the capture, at Jena, of specimens with the spots more or less broadly surrounded by white; and one had a complete row of blue lunules on the hindwings (*ab. subcaeruleolunulata*). Bartel notes the capture of an example of *albicincta* near St. Moritz, July 24th, 1904. Reverdin notes (*in litt.*) it as not uncommon in the Geneva district, and Blachier writes that he has an example in which all four discoidals are ringed with white (= *ab. albipuncta*). South exhibited (*Proc. Sth. Lond. Ent. Soc.*, 1902, p. 105) a ♀ with four white discoidal spots and a white submarginal lunulate line on all wings, taken in Wiltshire (= *albipuncta-lunulata*). Neustadt and Kornatzki (*Schmett. Schlesiens*), judging from their illustration of the ♀ *coridon*, seem to have regarded this (*albicincta*) as the usual form of the ♀. Aigner-Abafi reports it from Budapest and Isaszegh. [See also *antea*, p. 12.]

*β. ab. aurantia*, Tutt, "Brit. Butts.," p. 167 (1896); Grover, "Ent. Rec.," ix., p. 312 (1897); Wheel., "Butts. Switz.," p. 31 (1903); Bartel, "Ent. Zeits. Guben.," xviii., p. 115 (1904); Seitz, "Gross-Schmett.," i., p. 315 (1909); Rebel, "Berge's Schmett.," 9th ed., p. 72 (1909). *Aurantiaca*, Lamb., "Pap. Belg.," p. 240 (1902); Haverk., "Ann. Soc. Ent. Belg.," i., p. 156 (1906); Lamb., "Cat. Léop. Belg.," p. 427 (1907). *Aurinata*, Grund, "Int. Ent. Zeits. Gub.," p. 87 (1908).—Dull blackish-brown, with distinct marginal orange spots edged internally with paler (Tutt).

Usually the ♀s of this species are poorly marked with orange on both fore- and hindwings, but, in many examples, the colour is intensified especially on the hindwings, and may be faintly edged again with pale greyish internally. Those ♀s with strongly marked orange spots on all the wings are our *ab. aurantia*. The pale edging in its extreme form, consists of a series of pure white lunules, and is then often continued in a modified form on the forewings (= *albolunulata*). Aigner-Abafi reports the *aurantia* form from Budapest and Isaszegh.



γ. ab. *semiaurantiaca*, Tutt, "Brit. Butts.," p. 167 (1896); Bart., "Ent. Zeits. Gub.," xviii., p. 115 (1904); Seitz, "Gross-Schmett.," p. 316 (1909); Rebel, "Berge's Schmett.," 9th ed., p. 72 (1909). *Semiaurantiaca*, Lamb., "Pap. Belg.," p. 240 (1902).—Dull blackish-brown, scaled with blue at bases of wings, orange marginal spots distinct, edged internally with paler (Tutt).

This is the form of the ♀ in which the bases of the wing are supplied with blue scales; the orange marginal spots distinct and well coloured on all the wings, with the inner edge of the orange lunules sometimes faintly edged with pale. It is a form parallel with *aurantia*, except for the blue scaling at the base of the wings. It is a not uncommon aberration; when first described we considered it rarer than appears to be the case.

δ. ab. *inaequalis*, Tutt, "Brit. Butts.," p. 167 (1896); Lamb., "Pap. Belg.," p. 240 (1902); Pickett, "Ent. Rec.," xv., p. 270 (1903); Haverk., "Ann. Soc. Ent. Belg.," i., p. 156 (1906); Bartel, "Ent. Zeits. Guben.," xviii., p. 115 (1904); Lamb., "Cat. Lep. Belg.," p. 427 (1907); Rebel, "Berge's Schmett.," 9th ed., p. 72 (1909); Seitz, "Gross-Schmett.," i., p. 315 (1909). *Corydon* ab., Pickett, "Proc. Sth. Lond. Ent. Soc.," p. 114 (1902).—With blue streaks sometimes varying on opposite wings of the same insect (Tutt).

Irregularity in the blue scaling is a not uncommon feature; specimens with one, or even all, the wings irregularly and asymmetrically marked with blue scales, are frequently observed. Hodgson notes (*in litt.*) that, near Brighton, in 1888, he took a ♀ with blue-scaled striæ between the nervures of the right forewing which showed no blue scaling elsewhere, whilst, in 1907 and 1909, near Reigate, several ♀s were taken irregularly marked with asymmetrical patches or spots of blue, especially on the hindwings. Pickett recorded *inaequalis* as being more abundant than usual at Dover, in August, 1903.

ε. ab. *calathis*, Jermyn, "Butt. Coll. Vade Mecum," 2nd ed., p. 169 (1827); Dbldy. and Westd., "Gen. Diurn. Lep.," p. 493 (1852). *Calathys*, Stephs., "Illus. Haust.," i., p. 89 (1828); Humph. and Westd., "Brit. Butts.," p. 105 (1841); Kirby, "Syn. Cat.," p. 368 (1871). *Calathæis*, Dale, "Hist. Brit. Butts.," p. 64 (1890). *Corydon* ab., Sladen, "Ent.," xxxv., p. 274 (1902).—Very like the preceding species (*thestylis* and *lacon*). Fringe barred with black; secondary wings underneath with a discoidal white-cinctured crescent, below which, towards the posterior margin, is an undulated band consisting of seven ocellated spots (Kirby, in Miss Jermyn's *Butt. Coll. Vade Mecum*, p. 169).

From the descriptions of the preceding "species," one learns that the upperside of the wings is black with a blue disc, a transverse discoidal spot, and marginal spots surmounted with orange, faintly on forewings, stronger on hindwings. Stephens, who no doubt had a good knowledge of the insects described by Miss Jermyn, refers this to his *coridon* var. β, but he seems to have no justification for adding to his description of the underside, the statement that the upperside of the wings has "a whitish discoidal spot with a black pupil," as Miss Jermyn indicates no such character. Humphreys and Westwood (*Brit. Butts.*, p. 105) just copy verbatim Stephens' description. Like so many "book makers" of to-day, they rarely made any first-hand references. It was no doubt then, as now, much easier to copy from the book nearest one's elbow. In this, then, we seem to have the ♀ form in which the discal area of all the wings is blue, but with ordinary dark discoidal lunules. There are, however, no details given to show to which form it should now be referred. Sladen notes (*Ent.*, xxxv., p. 274) the capture of ♀s, in north Wilts, with a central splash of



blue, the distribution of colour in this latter case, resembling that of dark forms of *Celastrina argiolus*. Stephens' insect, therefore, is to be considered an example of *calaethis-albicincta*.

♂. ab. *semibrunnea*, Mill., "Icon.," p. 84, pl. iv. (rect. viii.), fig. 3 (1859).—*Semibrunnea*, which is a ♀, appears to me to be new, no author to my knowledge has yet mentioned it. This aberration falls midway between the typical ♀ and the ab. *mariscolore* of authors. In size, *semibrunnea* is as large as the largest ♀s of *corydon*. Above, the silvery-blue instead of covering the wings almost entirely as in the ab. mentioned, leaves large brown spaces. The fringe is preceded by a brown margin in which the terminal dots appear faintly. The discoidal lunule of the forewings black, small, and resting on a ground of silvery-blue; that of the hindwing is bluish, striking in appearance on the brown ground colour. Beneath, the wings are typical, unless it be that the fulvous of the marginal chevrons is very pale. This rare aberration, which is in my cabinet, came from la Pape, a locality situated to the north-east of Lyon (Millière).

This is a remarkable aberration of *A. coridon*, the figure depicting a form in which the nervures of the hindwings are whitish (the description says "silvery-blue"); and the interneural spaces between the marginal area and discoidal on both wings similarly scaled, with extra pale scaling along the inner margin of both wings and the base of hindwings; the central and basal area of the forewings, and the centre of the hindwings brown. The discoidal of the forewings ringed with white. It is really, therefore, exceedingly different from our *semisyngrapha*, which has the hindwings scaled with blue from base to margin, and the forewings with blue from base to discoidal, rarely beyond. Chapman notes that the arrangement of the light and dark parts in Millière's figure has a very curious effect. It would appear from the descriptions that this is a blue form somewhat similar to that of *radiosa*, Gaschet, both having blue nervures, the main differences apparently being that it is less blue just before the margin of the hindwings, and combines with the characters of *radiosa* that of our *caeruleopuncta*. Wheeler, Bartel, Rebel, Seitz, and others, refer this to our *semisyngrapha*; it is most unfortunate that the original figures and descriptions have not been more carefully studied. De Rougemont cites (*Cat.*, p. 22) it for Neuchâtel, Agassiz for the Bernese Jura, Warburg notes it from Cannes.

η. ab. *radiosa*, Gaschet, "Bull. Soc. Ent. Fr.," ser. 5, vii., p. lxiv (1877). *Corydon* var., Sladen, "Ent.," xxxv., p. 274 (1902).—As the description of *L. adonis* ab. *radiata*\* (*op. cit.* p. 63) applies exactly to this ♀ form of *corydon*, I consider it useless to reproduce it. The only differences are—(1) the blue of the nervures is darker; (2) the interneural spaces are not of a deep blue but black. The striking similarity that exists between the aberrations of these two species should be noticed, and I feel I cannot do better than give them the same name in a different form. From Charente-Inférieure—St. Georges near Royan. Less rare than *radiata*, without being frequent (Gaschet).

This is a blue form of the ♀, in which the blue is restricted to the nervures, and has the appearance of radiate lines uniting on the outer margin of the hindwings, and strengthened by the blue lunules surmounting the orange chevrons. [South's drawing (*Ent.*, xx., pl. i.,

\* *Lycaena adonis* ab. *radiata*, ♀. The nervures of the hindwings of a brilliant azure blue, the interneural spaces of a deep blue, encroaching on the black, and radiating in the direction of the outer margin; just before the marginal spots the dark tint is effaced and the azure blue alone remains. The black marginal spots are adorned with fulvous lunules, as in the ab. *ceronus*. The forewings show the same characteristics as the hindwings, but less strikingly; the tints are a little deeper (Gaschet).

fig. 12) is a very good illustration of the exact opposite to *radiosa*, in which the nervures are dark and the interneural spaces blue, resulting, however, in a similar radiate appearance=ab. *subradiosa*, n. ab.] An aberration of this form is mentioned by Bellier de la Chavignerie (*Ann. Soc. Ent. France*, 1858, p. 310) as having been taken near Paris. He compares it with the ♀ of *P. meleager*. Sladen records (*Ent.*, xxxv., p. 274) that, in 1902, he captured, in Wiltshire, a ♀ with the veins of the hindwings blue, the intervening spaces being normal in colour, and adds that, in the usual form of blue variation, the veins remain black, whilst the intervening spaces are blue, as is the case in our ab. *subradiosa*.

θ. ab. *semisyngrapha*, Tutt, "Brit. Butts.," p. 167 (1896); Lamb., "Pap. Belg.," p. 240 (1902); "Cat. Lép. Belg.," p. 427 (1907); Hodgson, "Proc. Sth. Lond. Ent. Soc.," p. 89 (1908). *Semibrunnea*, Wheeler, "Butts. Switz.," p. 31 (1903); Bartel, "Ent. Zeits. Guben," xviii., p. 114 (1904); Rebel, "Berge's Schmett.," 9th ed., p. 72 (1909); Seitz, "Gross-Schmett.," p. 315 (1909); Keynes, "Ent. Rec.," xxi., p. 263 (1909). *Corydon* ab., Barr., "Lep. Br. Is.," pl. xii., fig. 1c (1893); South, "Proc. Sth. Lond. Ent. Soc.," p. 49 (1906).—With blue base as far as discoidal spot on forewings; blue from base to outer margin on hindwings (Tutt).

This is the more usual extreme form of the blue ♀ taken in England, the hindwing being that of *tithonus* (*syngrapha*), the forewing only blue to the discoidal or just beyond. It appears even then to be confined to certain localities, and to be more particularly abundant in them in certain seasons, especially among the later-appearing examples (mid-September, 1907, at Cuxton). We have taken it not uncommonly on the Halling and Cuxton downs in various seasons since 1871, and Keynes notes (*Ent. Rec.*, xxi., p. 263) it as specially abundant at Royston, one of its Hertfordshire localities, whilst, in other places comparatively near, it is rarely seen; Rowland-Brown notes it as occurring occasionally among the September ♀s near Kimble; Pickett finds it distinctly rare near Dover, and Hodgson in Surrey and Sussex, remarking that it is usually much less common than the corresponding "blue" ♀ of *A. thetis*, although the latter notes the late, cold, wet season of 1888, as an unusually good year for "blue" aberrations in the Brighton district; 1907 and 1909 are also noted as good years for these forms; and South reports the form from Eastbourne. One suspects that such are generally rare on the continent, if one judges by the paucity of records. Doleschall says that he gets intermediates between *syngrapha* and the type at Brünn in Moravia, a rather vague description, that may refer to other of the blue forms. Several recent authors—Bartel (*Ent. Zeits. Guben*, xviii., p. 114), Rebel (*Berge's Schmett.*, 9th ed., p. 72), Seitz (*Gross-Schmett.*, i., p. 315), etc., sink this exceedingly fine form as being the same as the merely blue-dusted *semibrunnea*, Mill. These authors can know neither form, nor could they have referred to Millièr. The two forms are quite dissimilar.

α. ab. *opposita*, n. ab. *Corydon* ab., Sladen, "Ent.," xxv., p. 274 (1902).—♀. The forewings blue, the hindwings brown with only a few blue scales, thus reversing the ordinary course of variation in this species.

This is an unusual form of variation. A specimen is recorded by Sladen as having been captured in North Wilts, in 1902.

κ. ab. *tithonus*, Meig., "Eur. Schmett.," ii., p. 30, pl. xlvii., fig. 2 (1830). *Corydon* var., Bergsträsser, "Nom.," iii., p. 3 (ref. to Schröter) (1779); Hb., "Eur. Schmett.," pl. 148, fig. 742 (1817); H.-Sch., "Sys. Bearb.," i., pl. lxxiv.,

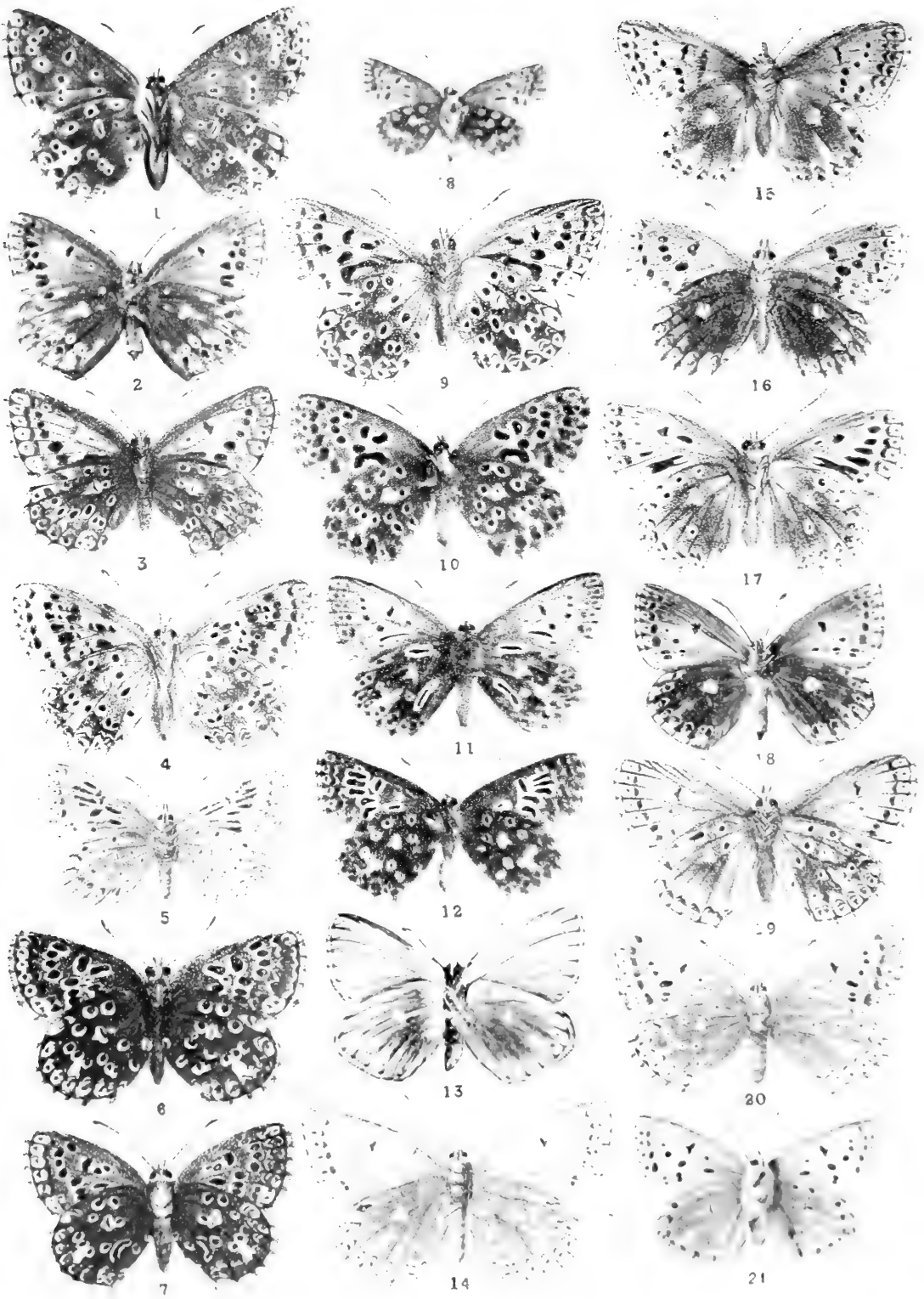
fig. 361 (1843); vi., supp. p. 27 var. *c* (1852); Barr., "Lep. Br. Is.," pl. xii., fig. 1*d* (1893); Pickett, "Ent. Rec.," xii., p. 272 (1902); "Proc. Sth. Lond. Ent. Soc.," p. 114 (1902); Trautm., "Int. Ent. Zeits. Guben," ii., p. 162 (1908). *Mariscolore*, Bdv., "Gen.," p. 12 (1840); Heydnr., "Lep. Eur. Cat. Meth.," p. 14 (1851); Gerh., "Mon.," p. 17, pl. xxxii., figs. 3*a-b* (1852); Bell, "Ann. Soc. Ent. Fr.," ser. 3, vi., p. 310 (1858); Mill., "Icon.," i., p. 84 (1858); Girard, "Ann. Soc. Ent. Fr.," ser. 4, v., p. 114 (1865); Berce, "Fn. France," i., p. 143, pl. vi., fig. 7 (1867). *Syngrapha*, [Kef., "Stett. Ent. Ztg.," xii., p. 308 (1851)]; Meyer-Dür, "Schmett. Schweiz," p. 86 (1852); Staud., "Cat.," 1st ed., p. 6 (1861); Kirby, "Syn. Cat.," p. 368 (1871); Staud., "Cat.," 2nd ed., p. 12 (1871); Sand, "Cat. Lép. Ber. Auv.," p. 6 (1879); Mosl., "Illus. Lep.," pt. vii., pl. v., fig. 6 (1880); Jourdh., "Cat. Lép. Aube," p. 18 (1883); Frey, "Lep. Schw.," p. 19 (1880); Berce, "Lép. Fr.," p. 17 (1884); Lang, "Butts. Eur.," p. 122, pl. xxvi., fig. 7 (1884); Kane, "Eur. Butts.," p. 45, pl. iv., fig. 11 (1885); South, "Ent.," xx., p. 4 (1887); Dale, "Hist. Brit. Butts.," p. 64 (1890); Rühl, "Pal. Gross-Schmett.," pp. 278, 763 (1892); Caradja, "Iris," vi., p. 176 (1893); Tutt, "Brit. Butts.," p. 167 (1896); Obth., "Etudes," xx., pp. 19 *et seq.* (1896); Mosley, "Nat. Journ.," v., supp. p. 9, pl. iv., fig. 1 (1896); Courv., "Soc. Ent.," xii., p. 26 (1897); Favre, "Macr.-Lép. Val.," p. 21 (1899); Staud., "Cat.," 3rd ed., p. 86 (1901); Spuler, "Schmett. Eur.," 3rd ed., i., p. 66 (1902); Lamb, "Pap. Belg.," p. 239 (1902); Sladen, "Ent.," xxxv., p. 274 (1902); Wheeler, "Butts. Switz.," p. 31 (1903); Bartel, "Ent. Zeits. Guben," xviii., p. 114 (1904); South, "Butts. Brit. Isl.," p. 168, pl. 117, fig. 8 (1906); Lamb, "Cat. Lép. Belg.," p. 427 (1907); Rebel, "Berge's Schmett.," 9th ed., p. 72 (1909); Seitz, "Gross-Schmett.," p. 315, pl. lxxxi., fig. *d* (1909). *Syngrapha*, Mill., "Cat. Lép. Alp.-Mar.," p. 104 (1872).—Thickly dusted with blue, with black central lunule; the hindwings with orange marginal spots; beneath brownish-grey, with eye-spots and orange marginal spots on hindwings. *Descr.*: ♀. Thickly sprinkled with greenish-blue scales, a central black lunule on each wing. The forewings on the costa and hindmargin broadly black-brown; the hindwings on the hindmargin with orange spots inwardly bounded by black angular marks, but outwardly containing black dots; fringes white spotted with pale brown. The underside brown-grey, with a black central spot and many ocellated spots placed as in the figure: on the outer margin there is a row of black dots, and, in front of them, similarly-coloured lunules, whilst between these the hindwings have orange spots. This butterfly occurs in June in the Tyrolese and Swiss Alps; the figure is taken from a specimen in the Liège museum. I have not seen the ♂ (Meigen).

**DISTRIBUTION.**—BELGIUM: With the type, Namur, rare (Lambillion), Han, Torgny (Haverkamp). ENGLAND: Kent—Dover (Pickett); [Surrey (Sweeting, *Proc. Sth. Lond. Ent. Soc.*, 1908, p. 76) wants confirmation]; Wilts—Devizes dist., Alton Barnes (Sladen). FRANCE: Aube—les Riceys (Jourdheuille); Bouches-du-Rhône—rare, Ste. Baume (Siepi); Calvados—rather rare (Fauvel), Amfréville, Eraines (Moutiers); Cher—Sologne, St. Florent, rather rare (Sand); Charente—between Jarnac and Rouillac (Giard); Charente-Inférieure—St. Romain-de-Benét (Robin, coll. Rowland-Brown), St. Georges near Royan (Oberthür); Dordogne (Tarel); Doubs—Besançon (Oberthür); Eure—Deux-Amants, Château-Gaillard (Dupont); Eure-et-Loire (Guenée); Haute-Garonne, occasionally (Aubusson); Hautes-Pyrénées, rare (Rondou); Indre—[form approaching *syngrapha* at Fongambault and Concremis (Martin),] Gargilesse (Sand); Loir-et-Cher—Forest of Russy, rather common (Chevillon); Maine-et-Loire—sometimes commoner than the type (Delahaye); Puy-de-Dôme—the hills of the Limagne, not rare (Guillemot); Clermont-Ferrand (Sand); Sarthe (Knockaert *cit.* Frionnet); Seine—Paris (Oberthür); Seine-et-Marne—Fontainebleau (Tutt); Seine-Inférieure—Orival (Martel); Saône-et-Loire—St. Sernin-du-Plain (Constant); La Grisière (Lafay). GERMANY: Hanover—Giesener Berg, near Hanover (Peets); Baden—the Turmberg at Durlach (Spuler and Meess); Prussia—Jena (Trautmann). Silesia (Neustädt and Kornatzki). SPAIN: Aragon (Nicholl); Masegar, Lindayos de Moscardin (Zapater). SWITZERLAND: Follatterre, near Fully, once (Favre), Gamsen (Courvoisier, *Soc. Ent.*, xii., p. 26); Neuchâtel (de Rougemont), Tramelan (Rühl); Bernese Jura (Agassiz). [Aigner-Abafi notes (*in litt.*) that this form does not occur in Hungary as Spuler says. Rühl gives Budapest.]

It appears very probable that the earliest reference to this insect is the note by Schröter, referred to by Bergsträsser (*Nom.*, iii., p. 3), where he says that the former speaks of a green *Argus* which is, indeed, very similar to *coridon*, but has the peculiarity that the

scaling which covers its wings is more green than blue, and has a beautiful lustre, and the ground colour, when the scales are removed, is not brown as in *coridon*, but ashy-grey and beautifully shining. Hübner first figured the insect (*Eur. Schmett.*, pl. 148, fig. 742) about 1817. Meigen then gave a good figure of the same form, but with discoidal lunules on all the wings (Hübner's figure only has them on the forewings), a dark band on the outer margin of forewings, and well-defined reddish marginal spots on hindwings, under the name *tithonus*. Boisduval, in 1840, called the species *mariscolore*, a very appropriate name, whilst Keferstein, in 1851, named it *syngrapha*, without description, merely referring to Hübner's pl. cxlviii., fig. 742, and Meigen's pl. xlvii., fig. 2, with the remark "var. *a*, *syngrapha*, Alpen, Pyrenäen," and the statement that "Meigen figures the alpine variety of *corydon*, but describes Ochsenheimer's *eros*." This is not at all accurate, for Meigen describes the insect that he figures most accurately (see our quotation *suprà*); he adds that he does not know the ♂ of his *tithonus*, but supposes it may be Ochsenheimer's *eros* (= *tithonus*, Hb.), the ♀ of which was not known, and quotes Ochsenheimer's description of *eros*, in case it should prove to be the ♂ of his insect. Herrich-Schäffer, writing (*Sys. Bearb.*, vi., supp. p. 27) of the form, notes that "some examples of the ♀ are silver-blue with red marginal lunules on the wings, as in Hübner's fig. 742," and that Lederer had "received it from Burgundy;" he adds that his "fig. 361 represents the under-side of such an example," i.e., a *tithonus* upperside and *parisiensis* under-side. In spite of the general statements to the contrary, the form does not appear to be particularly, if at all, alpine. The examples in the British Museum coll. vary somewhat, e.g., (1) in the number of the discoidal spots, sometimes two (*lunulata*), usually four (*typica*); (2) in the presence or absence of a pale line passing through the marginal border of forewings from costa to inner margin representing the inner marginal edge of obsoletely-marked interneural spots (*divisa*); (3) the absence or presence of the orange spots on forewings; all the specimens have orange lunules on the hindwings (*tithonus*), and almost all on the four wings (*aurotithonus*). The examples are labelled "Central France" (4), "France" (2), "Pyrenees" (6), so that all are really French. In some districts, and perhaps only in some seasons, the most extreme forms apparently occur as "discontinuous variations," occurring singly with large numbers of brown ♀s showing no trace of blue. This seems to be the case at Fontainebleau, etc., but, in England, the extreme specimens, still *tithonus*, but often less brilliantly and less thickly scaled with blue, are distinct extremes of the series illustrated by *subradiosa*, and *semisyngrapha*. This is the case at Dover, where in August, 1900, Pickett took two examples in a locality that he works every season for the less-marked "blue" aberrations, whilst Sladen notes (*Proc. Sth. Lond. Ent. Soc.*, 1902, p. 114) that "in the place, near Devizes, where the examples of *tithonus* (*syngrapha*) are taken, the ♀s vary from the typical form with a few dots or splashes of blue on the hindwings to full-blown *syngrapha*." Sladen further notes (*Ent.*, xxx., p. 81) that, near Devizes, in August, 1896, he captured nine blue ♀ ab. *syngrapha*, and saw as many worn ones, whilst, in 1901, he captured 30, and, in 1902, 12 (*op. cit.*, xxxv., p. 274). Trautmann records (*Ent. Zeits. Guben*, 1908, p. 162) the capture, at Jena, of two light blue ♀s which differed very little from typical ♂s. Dupont says (*Bull. Soc. Amis Sc.*





UNDERSIDE ABERRATIONS OF *AGRIADES CORDON*, Poda.

EXPLANATION OF PLATE II.

(To be bound facing Plate II.)

UNDERSIDE ABERRATIONS OF AGRIADES CORIDON.

- Fig. 1.—AGRIADES CORIDON, Poda.  
Fig. 2.—AGRIADES CORIDON ab. DISCRETA, Tutt (fore- and hindwings). ♂.  
Fig. 3.—AGRIADES CORIDON ab. ANTICO-DISCRETA, Tutt (forewings only). ♀.  
Fig. 4.—AGRIADES CORIDON ab. ADDENDA, Tutt. ♂.  
Fig. 5.—AGRIADES CORIDON ab. ANTICO-JUNCTA, Tutt. ♂.  
Fig. 6.—AGRIADES CORIDON ab. GLOMERATA, Tutt. ♀.  
Fig. 7.—AGRIADES CORIDON ab. BASIJUNCTA, Tutt. ♀.  
Fig. 8.—AGRIADES CORIDON ab. MINOR-DISCRETA, Tutt. ♂.  
Fig. 9.—AGRIADES CORIDON ab. PARISIENSIS, Gerh. ♂.  
Fig. 10.—AGRIADES CORIDON ab. PARISIENSIS, Gerh. ♀.  
Fig. 11.—AGRIADES CORIDON ab. CONFLUENS, Tutt. ♂ (combining PARISIENSIS + COSTAJUNCTA + BASIJUNCTA).  
Fig. 12.—AGRIADES CORIDON ab. ANTICO-EXTENSA, Tutt. ♀.  
Fig. 13.—AGRIADES CORIDON ab. OBSOLETISSIMA, Tutt. ♂.  
Fig. 14.—AGRIADES CORIDON ab. CORYDONIS, Bergstr. ♀.  
Fig. 15.—AGRIADES CORIDON ab. CINNUS, Gerh. ♂.  
Fig. 16.—AGRIADES CORIDON ab. CINNUS, Gerh. ♀.  
Fig. 17.—AGRIADES CORIDON ab. BIARCUATA-OBSOLETA, Tutt. ♂.  
Fig. 18.—AGRIADES CORIDON ab. CINNUS-OBSOLETA, Tutt. ♂.  
Fig. 19.—AGRIADES CORIDON ab. IRREGULARIS-OBSOLETA, Tutt. ♂.  
Fig. 20.—AGRIADES CORIDON ab. IRREGULARIS-OBSOLETA, Tutt. ♀.  
Fig. 21.—AGRIADES CORIDON ab. IRREGULARIS-OBSOLETA, Tutt. ♂.





*Nat. Rouen*, 1903, p. 97) that it occurs in the Pont de l'Arche district "with the type but scarcer; it is more often taken at Deux-Amants, where, in the forest, it is particularly beautiful; it has also been taken at Château-Gaillard, near Andelys, where the type is extremely abundant." One suspects the record of Neustädt and Kornatzki who speak of it as "common" in Silesia.

#### UNDERSIDE FORMS.

*a. ab. corydonis*, Bergstr., "Icon.," dec. 2, pl. i., figs. 7-8 (1779); "Nom.," iii., p. 17, pl. lix., figs. 7-8 (1779). *Cinnus*, Hb., "Eur. Schmett.," pl. 167, figs. 830-831 (1823-33); Bdv., "Gen. et Ind. Meth.," p. 12 (1840); Dup., "Cat. Méth. Lép.," p. 33 (1844); Heyd., "Lep. Eur. Cat.," p. 14 (1851); Dbldy. and Westd., "Diurn. Lep.," ii., p. 493 (1852); H.-Sch., "Sys. Bearb.," vi., supp. p. 27 (1852); "Ind. Alph. Syn. to vol. i.," p. 7 (1852); Meyer-Dür, "Schmett. Schweiz.," p. 86 (1852); Kirby, "Syn. Cat.," p. 368 (1871); Gillm., "Illus. Zeits. für Ent.," v., pp. 50-52 (1900); "Allg. Zeits. für Ent.," vii., pp. 339-340 (1902); "Soc. Ent.," xvii., p. 68 (1902); Spuler, "Schmett. Eur.," 3rd ed., i., p. 66 (1902); Lamb., "Pap. Belg.," p. 239 (1902); Favre, "Lép. Valais," supp., p. 4 (1903); Courv., "Mitt. Schw. Ent. Gesell.," xi., pt. 1, p. 25 (1903); Dupont, "Bull. Soc. Am. Sc. Nat. Rouen.," p. 97 (1903); "Lép. Pont de l'Arche.," p. 33 (1903); Gillm., "Soc. Ent.," xviii., p. 181 (1904); Krodell, "Allg. Zeits. Ent.," ix., pp. 51, 107, figs. 5-6 (1904); Bartel, "Ent. Zeits. Gub.," xviii., p. 114 (1904); Leonhdt., "Ins. Börse.," xxii., pp. 124, 127, 131 *et seq.* fig. 12 (1905); Rebel, "Berge's Schmett.," 9th ed., p. 72 (1909); Seitz, "Gross-Schmett.," i., p. 316, pl. lxxxi., *d* (1909). *Corydon* var., Stphs., "Illus. Haust.," i., p. 89, var. *e* (1828); Freyer, "Neu. Beit.," iii., p. 45, pl. 223, fig. 1 (1839); Meyer-Dür, "Schmett. Schweiz.," p. 87, var. *g* (1852); Bellier, "Ann. Soc. Ent. France.," ser. 3, vi., pp. 309-310 (1858); Mosley, "Illus. Vars. Brit. Lep.," pt. vii., pl. v., fig. 1 (1880); South, "Ent.," xx., p. 5, pl. i., fig. 1 (1887); Sab., "Proc. Sth. Lond. Ent. Soc.," p. 70 (1887); West, "Proc. Sth. Lond. Ent. Soc.," p. 66 (1887); Oberth., "Etudes.," xx., p. 20, pl. iii., figs. 30, 33 (1896); Pickett, "Ent. Rec.," xii., p. 272 (1900); "Proc. Sth. Lond. Ent. Soc.," p. 114 (1902). *Lucretia*, Gasch., "Bull. Soc. Ent. Fr.," ser. 5, vii., p. lxiv (1877); Dupont, "Feuille des Jeunes Nat.," xiv., p. 34 (1884); South, "Ent.," xx., p. 73, pl. i., fig. 1 (1887); Mosley, "Nat. Journ.," v., supp., p. 10, pl. iv., fig. 4 (1896); South, "Brit. Butts.," p. 168, pl. 118, fig. 12 (1906). *Sohni*, Rühl, "Soc. Ent.," vii., p. 190 *in part* (1893); "Pal. Gross-Schmett.," i., p. 279 (1892-5); Tutt, "Brit. Butts.," p. 168 (1896); Lamb., "Pap. Belg.," p. 239 (1902). *Privatissima*, Courv., "Mitt. Schw. Ent. Gesell.," xi., p. 25, pl. ii., fig. 8 (1903); Bartel, "Ent. Zeits. Guben.," xviii., p. 117 (1904). *Obsoleta*, Pickett, "Ent. Rec.," xv., pp. 270-271 (1903); "Proc. Sth. Lond. Ent. Soc.," p. 47 (1906). *Corydonius* (printer's error for *corydonis*), Tutt, "Proc. Sth. Lond. Ent. Soc.," p. lxxx (1909).—A variety of *corydon* ♀, according to Gerning. I should not be disinclined to consider it to be the ♀ of *endymion*, if it were not that the latter was one of those species in which the orange is absent on the underside of the hindwings (Bergsträsser).

Bergsträsser figures (*Nom.*, iii., pl. lix., figs. 5-6, 7-8) two ♀ *A. coridon* under the name *corydonis*. The first, represented in figs. 5-6, is just typical ♀ *coridon*, the second, represented by figs. 7-8, is the oldest picture of the fairly common obsoletely-marked underside form, in which only the discoidal spots and marginal lunules remain. This form was not figured again for about 45 years, when Hübner gave an illustration of it (*Eur. Schmett.*, pl. 167, figs. 830-831) and renamed it *cinnus*. It was correctly referred, under this name, to *A. coridon* as an aberration by Boisduval, Duponchel, Heydenreich, Doubleday and Westwood, Herrich-Schäffer, Meyer-Dür, and Kirby, in fact by all reputable authors until 1871, when Staudinger, evidently following Keferstein, and without personal reference (as seems to have been the case with most of his varietal synonymy), trans-

ferred the name to *A. thetis* with a diagnosis not agreeing with the figures. Following the publication of Staudinger's *Catalog*, 2nd ed., came the period when authors ceased to refer to original figures and descriptions, but accepted the *Catalog* as biblically inspired, instead of a mere copy of the work of Keferstein, Lederer, and others, and full of errors. In 1900, Gillmer reverted to the original view that *cinnus* was an aberration of *coridon*, a view that was followed by Staudinger in the 3rd edition of his *Catalog* in 1901, though he uses the name as Gerhard (and not as Hübner) does, and gives the diagnosis "*alis posticis subtus non ocellatis*," for his *cinnus*. In 1902, therefore, we found ourselves exactly where Boisduval and the other entomologists were between 1840 and 1871. Evidently absolutely ignorant of the literature, Gaschet renamed the form *lucetia*, followed in due course by South (as late as 1906). In the meantime, Rühl, evidently without any search whatever, renamed it *sohni*, so that the insect has been well-supplied with names by the continental entomologists. Blachier notes (*in litt.*) two ♀s with all four wings without ocelli, from Thoiry and Fully, and Muschamp captured a ♂ on the Dent du Midi, July 25th, 1909. It is reported as occurring rarely with the type at Weinböhla, near Dresden; Trautmann notes two ♀s from Jena; Dupont states that, at Pont de l'Arche, it appears to occur only among the ♀s, although he took one of each sex in August, 1887, in Vaud and the Valais. Aigner-Abafi notes it from Hungary, at Budapest, Isaszegh, etc. Verity, under the name of *sohni*, reports the form as being very frequent in the Florence district. It occurs in England with the type in almost all localities, and Pickett, who has made a remarkable effort to obtain large numbers of aberrations of this species, has four ♂s and four ♀s, taken chiefly near the South Foreland on the Kent coast. He notes the capture on August 15th, 1903, of 2 pairs *in cop.*, both ♂s and ♀s being of this form. We have already dealt with this form (*antea*, p. 18).

β. ab. *cinnus*, Gerh., "Mon.," p. 17, pl. xxxii., figs. 2a-b (1852); Meyer-Dür, "Schmett. Schweiz," p. 87 (1852); Staud., "Cat.," 3rd ed., p. 86 (1901); Wheeler, "Butts. Switz.," p. 32 (1903). *Corydon* var., Treitschke, "Die Schmett.," x., pt. 1, p. 67 (1834); Bell, "Ann. Soc. Ent. Fr.," ser. 3, vi., p. 310 (1858); Girard, "Ann. Soc. Ent. Fr.," ser. 4, v., p. 114 (1865); South, "Ent.," xx., p. 6, pl. i., figs. 2, 3 (1887); Sykes, "Ent.," xxiv., p. 266 (1891); Barr., "Lep. Br. Is.," pl. xii., fig. 1j (1893); Sladen, "Ent.," xxxv., p. 275 (1902); Leonh., "Ent. Zeits. Gub.," xvi., p. 50 (1902); "Ins. Börse," xxii., p. 128, figs. 4-9 (1905); South, "Br. Butts.," pl. cxviii., fig. 9 (1906). *Obsoleta*, Bartel, "Ent. Zeit. Guben," xviii., p. 115 *in part* (1904).—The forewings with the usual submedian row of spots more or less well developed; the hindwings with the submedian row obsolete.

This (*postico-obsoleta*) form was figured under the name *cinnus* by Gerhard, who noted it as occurring very rarely in Austria and France. His figure is that of a ♀, the underside with submedian row of spots and the discoidal on the forewings, the discoidal only on the hindwings; the orange marginal eye-spots or lunules present on all the wings. Our own examples come from Kent, etc. South notes (*Ent.*, xx., p. 6) specimens from Ventnor in which the hindwings are without any spots other than the discoidal, and the ocellated character of the forewings almost normal. He figures (pl. i., figs. 2-3) a ♂ and ♀ of this form. This appears to be a comparatively common form of the obsolete series; we have seen probably two or three dozen examples in various British collections, and we have repeatedly taken it abroad.

Two examples are recorded by Hering from Garz, without ocellated spots on the underside of the hindwings. Bartel also notes (*Ent. Zeit. Guben*, xviii., p. 115) the capture of a ♂ at St. Moritz, July 24th, 1904, without ocellated spots on the hindwings, whilst the right forewing has no basal spots and the left forewing only the lower one, and both forewings want the first spot of the submedian row. Blachier further records two ♂s absolutely without ocelli on the hindwings, from Thoiry and Hermance, and a similar ♀ from Gex; he also notes a ♀ without ocelli, the forewings, however, strongly of the *biarcuata* form (= *cinnus-biarcuata*) from Archamp. Sykes records (*Ent.*, xxiv., p. 266) a ♀ with all the spots of the submedian series absent on hindwings, and only the three lowest of the same series on the forewings present. Rowland-Brown took an almost similar example at Saas-Fée in August, 1897.

γ. ab. *antico-obsolata*, n. ab. [? *Dorylas* var., H.-Sch., "Sys. Bearb.," i., pl. lxxiv., fig. 313 (1842) or *A. thetis*.] *Corydon* var., South, "Ent.," xx., p. 6 (1887); Barr., "Lep. Br. Isles," pl. xii., fig. 1 (1893); Stiff, "Ent.," xxii., p. 160 (1889).—The forewings without the basal and submedian row of spots, the hindwings with the spotting fairly or quite normal.

This appears to be an exceedingly rare form compared with ab. *cinnus*, Gerh. Neither South (*Ent.*, xx., pl. i) nor Krodell (*Allg. Zeits. Ent.*, ix) nor Leonhardt (*Ins.-Börse*, xxii., p. 128) figure a distinct aberration of this form. South, however, refers (*Ent.*, xx., p. 6) to the capture of such at Ventnor, in which "only the discoidal on the forewings are present, whilst nearly all the ocelli occur on the hindwings." There are, however, several examples in different collections and Pickett notes (*in litt.*) five ♂s and five ♀s in his own collection, all captured in the Dover district. Stiff records the capture of a ♀, at Lulworth, on September 12th, 1888; in this specimen only two spots of the corresponding series are present on each hindwing. Reverdin also describes one taken on the Täschalp, August 29th, 1907, as follows: the ocellated spots on the forewings wanting, those on the hindwings small and partly lacking, particularly on the right hindwing (ill-developed) which has only two dots of the submedian series, the left having five (Reverdin). [Rühl adds, under his description of *sohni* (*Pal. Gross.-Schmett.*, p. 279), a note on the occurrence of examples that agree with *corydonis*, Bergstr., except that one or two spots are sometimes present on the hindwings; although these (like Stiff's example) do not strictly belong to this form, it appears advisable to note them here.]

δ. ab. *sinistro-obsolata*, n. ab.—The underside of the two left wings of the form *corydonis*, of the two right wings almost or quite normal.

ε. ab. *dextro-obsolata*, n. ab.—The underside of the two right wings with the basal and submedian row of spots absent, the discoidal and marginal spots alone being present; the spotting of the other two wings almost or quite normal.

We have occasionally seen examples of these two forms. Pickett (*antea* p. 18) mentions three ♂s and six ♀s in his collection of *dextro-obsolata*, and four ♂s and three ♀s of *sinistro-obsolata*, all from the Dover district.

ζ. ab. *obsolata*, Tutt, "Brit. Butts.," p. 167 (1896); Lamb., "Pap. Belg.," p. 240 (1902); Wheel., "Butts. Switz.," p. 32 (1903); Krodell, "Allg. Zeits. für Ent.," ix., p. 50, figs. 2-4 (1904); Bartel, "Ent. Zeits. Gub.," xviii., pp. 115, 117 *in part* (1904); Leonh., "Ins. Börse," xxii., pp. 127-128, figs. 3, 10 (1905); Pickett, "Proc. Sth. Lond. Ent. Soc.," p. 47 (1906); Lamb., "Cat. Léop. Belg.," p. 156 (1907); Rebel, "Berge's Schmett.," 9th ed., p. 72 (1909); Keynes, "Ent. Rec.," xxi.,

p. 263 (1909); Tutt, "Proc. Ent. Soc. Lond.," p. lxxx (1909). *Corydon* var., Girard, "Ann. Soc. Ent. Fr.," ser. 4, v., p. 114 (1865); South, "Ent.," xx., p. 5, pl. i., fig. 4 (1887); Sabine, "Proc. Sth. Lond. Ent. Soc.," p. 70 (1887); Krod., "Allg. Zeits. Ent.," ix., p. 107 (1904); South, "Brit. Butts.," pl. 109, fig. 10 (1906); Coote, "Proc. Sth. Lond. Ent. Soc.," p. 80 (1907). *Privata*, Courv., "Mitt. Schw. Ent. Gesell.," xi., p. 24 (1903); Bartel, "Ent. Zeits. Guben.," xviii., p. 117 (1904); Seitz, "Gross-Schmett.," i., p. 316 (1909).—With the spots on the underside tending strongly to obsolescence (Tutt).

This name is applied to those forms in which several spots are obsolete on the underside of one or more of the wings. The form is a comparatively common one. Bartel mentions (*Ent. Zeits. Gub.*, xviii., pp. 115, 117) a ♂ from St. Moritz, July 24th, 1904, which has only three and five spots respectively in the submedian row of the right and left forewings, and six and four spots in that of the right and left hindwings; the right forewing has one basal spot only. Another ♂ from St. Moritz has normally-spotted forewings, but the hindwings with three to six little black spots, whilst a ♀ (of the *albicincta* form on the upperside) has also several of the spots obsolete on the underside of the hindwings. Keynes took five specimens in the Binnenthal, August 19th-21st, 1905, and Wheeler two in the Rhone Valley, on July 30th and August 2nd, 1906, the first at Aigle, the second at Martigny. Blachier records two ♂s with the greater part of the spots absent on the hindwings, one from Fully, the other from Brides-les-Bains; Bellier notes it as occurring near Paris and at Gavarnie; Aigner-Abafi records it (*in litt.*) from Budapest, Isaszegh, etc., and it has, no doubt, a pretty general distribution as an aberrative form. Newman reports (*Ent. Rec.*, xx., p. 270) it from Dover. It is occasionally taken in almost all localities, British and Continental, that we have worked for the species.

η. ab. *irregularis-obsoleta*, n. ab. *Corydon* var., South, "Ent.," xx., pl. i., fig. 4 (1887). *Cinnus*, Obth., "Etudes," xx., pl. iii., fig. 31 (1896).—The underside of one or three of the wings of the *corydonis* form; the other wings almost or quite normal.

South's example noted above is now in the "Adkin coll." Blachier mentions (*in litt.*) the capture at Thoiry and Gex of two ♀s, each without ocellated spots on the right hindwing, the spotting of the other wings normal. We have seen several in British collections.

θ. ab. *impuncta*, Courv., "Mitt. Schw. Ent. Gesell.," xi., pt. 1, p. 24 (1903); Bartel, "Ent. Zeits. Gub.," xviii., p. 117 (1904); Rebel, "Berge's Schmett.," 9th ed., p. 72 (1909); Seitz, "Gross-Schmett.," i., p. 316 (1909). *Corydon* var. δ, Stphs., "Illus. Haust.," i., p. 89 (1828); Adkin, "Proc. Sth. Lond. Ent. Soc.," p. 107 (1902). *Stefanelli*, Verity, "Bull. Ent. Soc. Ital.," xxxvii., p. 11 (1904); xxxviii., p. 29 (1906).—Without basal spots to underside of forewings (Courvoisier).

ι. ab. *unipuncta*, Courv., "Mitt. Schw. Ent. Gesell.," xi., pt. 1, p. 24 (1903); Bartel, "Ent. Zeits. Guben.," xviii., p. 117 (1904); Rebel, "Berge's Schmett.," 9th ed., p. 72 (1909); Seitz, "Gross-Schmett.," i., p. 316 (1909).—With only one basal spot to underside of forewings (Courvoisier).

κ. ab. *tripuncta*, Courv., "Mitt. Schw. Ent. Gesell.," xi., pt. 1, p. 22, pl. ii., fig. 7a (1903); Bartel, "Ent. Zeits. Guben.," xviii., p. 117 (1904); Rebel, "Berge's Schmett.," 9th ed., p. 72 (1909).—With three basal spots to underside of forewings (Courvoisier).

λ. ab. *quadripuncta*, Courv., "Mitt. Schw. Ent. Gesell.," pt. 1, p. 22, pl. ii., fig. 7b (1903); Bartel, "Ent. Zeits. Gub.," xviii., p. 117 (1904); Rebel, "Berge's Schmett.," 9th ed., p. 72 (1909).—With four basal spots to underside of four wings (Courvoisier).

μ. ab. *elongata*, Courv., "Mitt. Schw. Ent. Gesell.," pt. 1, p. 19, pl. ii., fig. 2a (1903).—With the lower basal spot streaked, the upper one normal (Courvoisier).

ν. ab. *parvipuncta*, Rebel, "Berge's Schmett.," 9th ed., p. 72 (1909).

*Corydon* ab., South, "Brit. Butts.," pl. 109, figs. 11, 12 (1909).—The spots on the underside of normal number and appearance, but much smaller in size than usual.

We have already noted this (*antèa*, p. 17). Reverdin states (*in litt.*) that he has a ♂ taken at Allevard, August 1st, 1909, very white beneath, of the *parvipuncta* form, with only one basal point on the underside of the left forewing (*unipuncta*) and with none on the right (*impuncta*), whilst spot 6 is also wanting in the submedian series on both sides.

ξ. ab. *crassipuncta*, Courv., "Mitt. Schw. Ent. Gesell.," xi., pt. 1, p. 19 (1903); Bartel, "Ent. Zeits. Guben," xviii., p. 115 (1904); Rebel, "Berge's Schmett.," 9th ed., p. 72 (1909). *Corydon* ab., Girard, "Ann. Soc. Ent. Fr.," v., p. 114 (1865); Mosl., "Illus. Vars. Brit. Lep.," pt. vii., pl. v., fig. 1 (1880); Barr., "Lep. Brit. Is.," pl. xii., fig. 1i (1893); South, "Ent.," xx., p. 6, pl. i., fig. 7 (1887); Pickett, "Proc. Sth. Lond. Ent. Soc.," p. 114 (1902).—The basal and submedian ocellated spots, also the discoidal, much enlarged (Courvoisier).

This large-spotted form occurs commonly aberrationally in Britain, although, as a rule, the largest-spotted examples are the ♀s. In some districts on the continent the species appears to be uniformly larger-spotted than in others, and this is particularly the case when the ground colour is darker, the specimens with white or whitish underside losing the surrounding rings in the ground colour, and leaving only the black kernels to represent the spots. In such cases the spotting looks particularly small. Blachier notes (*in litt.*) a ♀ captured at Thoiry with exceptionally large spots. The spring races that occur in the Riviera are also rather heavily-spotted (see *antèa*, p. 17).

o. ab. *extensa*, Tutt, "Proc. Ent. Soc. Lond.," p. lxxx (1909). *Corydon* var., Barr., "Brit. Lep.," pl. xii., fig. 1h (1893). *Striata*, Seitz, "Gross-Schmett.," i., p. 316 (1909).—The spots in the submedian series of both wings enlarged and pointing towards the discoidal.

We have seen several examples of this form, and have two or three of which the spots of the submedian row are particularly well-developed in this direction; the extension takes place more often in the forethan in the hindwings.

π. ab. *antico-extensa*, n. ab. *Corydon* var., Mosl., "Illus. Vars. Brit. Lep.," pt. vii., pl. v., fig. 3 (1880). *Striata*, Leonh., "Ent. Zeits. Gub.," xviii., p. 54 (1904).—The anterior wings with the spots of the submedian row extended either as wedges or ovals towards the base, the two lowest often considerably approaching the lower basal spot, the others simply extended (and not joined to other spots). The hindwings more or less normally spotted. One example under observation, however, has the submedian series largely obsolete.

Blachier notes (*in litt.*) a ♂ with the submedian series of spots in the form of wedges on the forewings, the spots of the hindwings normal. Mosley's figure is, in addition, of the *costajuncta* form on the hindwing.

ρ. ab. *postico-extensa*, n. ab.—The submedian series of spots on the hindwings extended as wedges or ovals towards the discoidal; the spotting on the forewings more or less normal.

σ. ab. *anticoextensa-obsolata*, n. ab. *Corydon* ab., Rehfsous, "Ent. Rec.," xx., p. 173 (1908).—Forewings with spots of the submedian row extended into streaks; the hindwings with the submedian and basal ocellated spots obsolete.

Blachier notices (*in litt.*) a ♂ of this form taken on Mt. Vuache, August 2nd, 1903. It is, of course, almost the exact opposite in the arrangement of the obsolete and striate parts to ab. *dolus*, Hb.

τ. ab. *dolus*, Hb., "Eur. Schmett.," pl. 167, fig. 829 (1823-33); Kef., "Stett. Ent. Ztg.," xii., p. 308 (1851); Krodell, "Allg. Zeits. Ent.," ix., p. 34, fig. 8 (1904).—♂. Underside of forewings unspotted; hindwings with submedian spots developed into stripes; no marginal chevrons to any of the wings.

This is a fine combination of the obsolete and striate types, and must be very rare in nature. We have never seen a similar example.

*v. ab. extensa-discoidalis*, n. ab. *Corydon* var., Mosley, "Illus. Vars. Brit. Lep.," pt. vii., pl. v., fig. 4 (1880).—Mosley figures (*Illus. Vars. Brit. Lep.*, pt. vii., pl. v., fig. 4) an excellent *extensa* form that comes under none of the usually described aberrations, in which the discoidal is divided into two parts, each forming a long streak, a third appears below these, whilst the lower basal forms a long streak. None of these elongated spots join with each other, and the submedian spots on both fore- and hindwings are normal.

*φ. ab. addenda*, Tutt, "Ent. Rec.," xxi., p. 300 (1909); "Proc. Ent. Soc. Lond.," p. lxxx (1909). *Corydon* ab., South, "Ent.," xx., p. 6, pl. i., fig. 8 (1887); Courv., "Mitt. Schw. Ent. Gesell.," xi., p. 23, pl. ii., fig. 7d (1903).—The underside presenting additional spots in usually unocellated areas.

Specimens with additional spots in usually unocellated areas are not uncommon in collections, and South has figured (*Ent.*, xx., pl. i., fig. 8) an exceptionally good example with some eleven supernumerary spots on each of the forewings. As in the parallel form of *A. thetis*, the spots are most frequently developed (1) between the outside of the discoidal and spots 2, 3, and 4 of the submedian series, (2) between the inside of the discoidal and the basal spots, (3) on the outside of spots 2, 3, and 4 of the submedian series, and (4) between the lower basal and lower submedian spots. They occur much more frequently in the fore- than in the hindwings, a rather remarkable fact considering that this means that they usually appear in just that portion of the forewing which is covered when the insect is at rest. The supernumerary spots vary in position, are often asymmetrical, and not at all necessarily the same in number on the opposite wings, and in their highest developed forms approach closely the best striate forms, most of which are formed by the union of the extra and normal spots into streaks. Gillmer notes (*in litt.*) examples with supernumerary spots between the discoidal and the submedian row, or in and close outside the latter. Reverdin notes a ♂, with three supernumeraries on the left and two on the right wing, taken at Bérissal, August 11th, 1909; he also notes a ♂ in which a black streak, 1.7mm. long on the left forewing, is developed between the discoidal and the 3rd spot of the submedian, a similar streak, but a little longer, in the same position on the right forewing, taken on the Täsch-alp, August 29th, 1907; another with the extra top spot (8th) in the submedian series, and a supernumerary between the 3rd submedian and discoidal on both forewings, taken at Alleverd, July 25th, 1909. The Rivieran (*meridionalis*) form is frequently subject to this *addenda* form of aberration. Reverdin notes it also in the Pardigon examples (*constanti*). Verity states (*in litt.*) that forms with accessory ocellated spots are very frequent in the Florence district.

*χ. ab. antico-juncta*, n. ab.—A beautiful striate form, the forewings with the submedian spots united in long streaks to the supernumeraries between the submedian series and the discoidal, the basal and discoidal and the lower basal, and two lower submedian. There is, therefore, a series of five submedian streaks, of which the 3rd is usually the longest, and one upper basal streak, all pointing to, but usually not touching, the discoidal, whilst beneath, in addition, there is often an arcuate or semiarcuate stripe with the slightest suspicion of another directly below it. The spotting of the hindwing is normal.

This is the finest developed form of the *addenda* series that has come under our notice. In it, the origin of the streaks from the normal and supernumerary dots is well exhibited. Our

best type, a ♂, was taken at Trafoi, August 13th, 1909. In the next stage, our *striata*, the union of the basal and submedian spots with the discoidal is too far advanced as a rule to exhibit the origin of the streak. A similar development on both fore- and hindwings we have called *juncta*, on the hindwings only *postico-juncta* (see *anteà*, p. 18).

ψ. ab. *striata*, Tutt, "Brit. Butts.," p. 167 (1896); "Ent. Rec.," ix., p. 80 (1897); Lamb., "Pap. Belg.," p. 240 (1902); Wheeler, "Butts. Switz.," p. 32 (1903); Pickett, "Ent. Rec.," xv., p. 270 (1903); Bartel, "Ent. Zeits. Guben," xviii., p. 115 (1904); Krod., "Allg. Zeits. für Ent.," ix., p. 54 (1904); Leonh., "Ins. Börse," xxii., p. 128 (1905); Pickett, "Proc. Sth. Lond. Ent. Soc.," p. 47 (1906); Lamb., "Cat. Lép. Belg.," p. 428 (1907); Rebel, "Berge's Schmett.," 9th ed., p. 72 (1909); Tutt, "Proc. Ent. Soc. Lond.," p. lxxx (1909). *Corydon* var., Stphs., "Illus. Haust.," i., p. 89 (1828); Mosley, "Illus. Vars. Brit. Lep.," pt. vii., pl. v., fig. 4 (1880). *Corydon* ab., Briggs, "Proc. Sth. Lond. Ent. Soc.," p. 80 (1887); Barr., "Lep. Br. Is.," pl. xii., fig. 1h (1893); Mosley, "Nat. Journ.," v., supp., p. 9, pl. iv., figs. 2-3 (1896); Pickett, "Proc. Sth. Lond. Ent. Soc.," p. 114 (1902); Leonh., "Ent. Zeits. Guben," xviii., p. 54 (1904). *Radiata*, Courv., "Mitt. Schw. Ent. Gesell.," xi., pt. 1, p. 22, pl. ii., fig. 6a (1903); Bartel, "Ent. Zeits. Gub.," xviii., p. 117 (1904); Rebel, "Berge's Schmett.," 9th ed., p. 72 (1909), *Tiphys*, Seitz, "Gross-Schmett.," i., p. 316 (1909).—With spots on the underside more or less united into streaks (Tutt).

This form was described to include those composite aberrations of the underside of the species, which showed traces of union between the spots of the submedian series of the fore- and hindwings and the discoidal, the union of the basal spots with one another or with the discoidal, the union of the marginal and submedian spots, the union of the lower basal and submedian spots in arcuate and biarcuate form, or the union of the costal spots on the hindwing and the inner marginal on the hindwing. All these aberrations are more or less frequent in occurrence, sometimes two or three forms included in the same individual, and it was not considered desirable at the time to separate the individual minor aberrations. Courvoisier dealt (*Mitt. Schw. Ent. Gesell.*, xi., p. 22, pl. ii., fig. 6) with this form of variation under his "Formæ radiatæ," his *radiata a-b* being merely a synonym of our *striata*. Our real type of this form, or rather the specimen which, when we described *striata*, we considered best illustrated the striate form has the 2nd, 3rd and 4th submedian spots of the forewing united to the discoidal, one of the basal streaks similarly joined thereto, whilst the lower basal and lower submedian are extended and approach the biarcuate form (see *anteà*, p. 17). It is to this form in which the submedian and basal spots unite with the discoidal that we would now restrict the name *striata*. Blachier gives us details (*in litt.*) of a good example of this form, a ♂, in which two of the streaks are confluent with the discoidal (whilst in ab. *antico-juncta* they fall short), taken on the Steinenalp at 1600m., August 14th, 1909, by L. Rehfsous.

ω. ab. *costajuncta*, Tutt, "Ent. Rec.," xxi., p. 300 (1909); "Proc. Ent. Soc. Lond.," p. lxxx (1909). *Striata*, Tutt, "Brit. Butts.," p. 167 *in part* (1896). *Corydon* ab., Gillm., "Ent. Zeits. Guben," xix., p. 74 (1905).—The first basal spot and the upper spot of the submedian row on the hindwing united. ♂, St. Gothard, August 3rd, 1907.

aa. ab. *basijuncta*, Tutt, "Ent. Rec.," xxi., p. 300 (1909); "Proc. Ent. Soc. Lond.," p. lxxx (1909). *Corydon* ab., South, "Ent.," xx., p. 7, pl. i., fig. 10 (1887). *Striata*, Tutt, "Britt. Butts.," p. 167 *in part* (1896).—The penultimate basal spot and the last two spots of the submedian row on the underside of the hindwing united.



These two forms are not uncommon. Gillmer describes a ♀ specimen of the *costajuncta* form taken at Nikolsburg in Moravia, July 29th, 1904, and we have seen several others in different collections. South mentions (*Ent.*, xx., p. 7) two examples, ♂ and ♀, of *basijuncta* taken at Folkestone, and figures the ♀ (*op. cit.*, pl. i., fig. 10).

ββ. ab. *semiarciata*, Courv., "Mitt. Schw. Ent. Gesell.," xi., p. 21, pl. ii., fig. 4d (left side) (1903); Rebel, "Berge's Schmett.," 9th ed., p. 72 (1909). *Corydon* ab., South, "Ent.," xx., p. 7 (1887); Adkin, "Proc. Sth. Lond. Ent. Soc.," p. 84 (1887); South, "Proc. Sth. Lond. Ent. Soc.," pp. 101-2 (1898). *Striata*, Tutt, "Brit. Butts.," p. 167 *in part* (1896). *Confluens*, Bartel, "Ent. Zeits. Guben," xviii., p. 115 (1904).—The lower spots of the submedian and basal series approaching each other, but not quite uniting into a single band.

This is a most common form of spotting, the lower basal spots and lower submedian spots of the forewing being extended towards each other, yet not forming a complete arch as in ab. *parisiensis*, Gerh. It occurs in almost all our British localities, and possibly in most Continental ones. We have it from Bourg d'Oisans, Grésy-sur-Aix, Clelles, Bourg St. Maurice, etc. It is recorded from Giesener Berg, near Hanover (Peets), the Mündelheim Dyke in the Rhine Provinces (Rothke), etc. Bartel notes under the name *confluens* (*Ent. Zeits. Gub.*, xviii., p. 115) a ♂ taken at St. Moritz, July 24th, 1904, which is of the semiarculate form on the right forewing, but normally spotted on the left.

γγ. ab. *parisiensis*, Gerh., "Mon.," p. 17, pl. xxxii., fig. 4 (1852); Bartel, "Ent. Zeits. Gub.," xviii., p. 114 (1904); Seitz, "Gross-Schmett.," i., p. 316 (1909); Tutt, "Proc. Ent. Soc. Lond.," p. lxxx (1909). *Corydon* var., H.-Sch., "Sys. Bearb.," i., pl. lxxiv., fig. 361 (1843); Gerh., "Mon.," pl. xxxviii., fig. 4 (copied from H.-Sch.) (1852); South, "Ent.," xx., pp. 6-7, pl. i., fig. 6 (1887); Adkin, "Proc. Sth. Lond. Ent. Soc.," pp. 169-170 (1891); South, "Proc. Sth. Lond. Ent. Soc.," pp. 101-102 (1898); Pickett, "Proc. Sth. Lond. Ent. Soc.," p. 114 (1902). *Tiphys* (*non* Esp.), Kefers., "Stett. Ent. Ztg.," xii., p. 308 (without description) (1851); Bartel, "Ent. Zeits. Gub.," xviii., p. 114 (1904); Leonh., "Ins. Börse," xxii., p. 128 (1905); Grund, "Int. Ent. Zeits. Guben," ii., p. 87 (1908); Seitz, "Gross-Schmett.," i., p. 316 (1909); Rebel, "Berge's Schmett.," 9th ed., p. 72 (1909). *Syngrapha*, H.-Sch., "Sys. Bearb.," vi., p. 27 (1854); Berce, "Fn. France," i., pl. vi., fig. 7 (1867). *Striata*, Tutt, "Brit. Butts.," p. 167 *in part* (1896). *Arcuata*, Wheel. (*nec* Weym.), "Butts. Switz., etc.," p. 32 (1903); Courv., "Mitt. Schw. Ent. Gesell.," xi., pt. 1, p. 21, pl. ii., fig. 4d (right side) (1903); Krodol, "Allg. Ent. Zeits. für Ent.," ix., p. 54 (1904); Keynes, "Ent. Rec.," xxi., p. 263 (1909). *Typhis*, Haverk., "Ann. Soc. Ent. Belg.," i., p. 157 (1906).—Both of these aberrations (*mariscolore* and *parisiensis*) are already known to be fairly distributed, though possibly the stable, yet minor, aberration has been less noticed, *i.e.*, the one in which the small spots at the base of the underside of the forewings coalesce with another of the spots, forming a long spot beneath the discoidal. As this aberration is chiefly sent to us from the Parisian entomologists who take it near Fontainebleau, we have named it *parisiensis* to distinguish it from *mariscolore* (Gerhard).

There is always a certain amount of excuse to be offered for the misidentification of not too well hand-coloured ♀s of this species and *A. thetis*, and slight (sometimes great) differences often occur in various copies of the same hand-coloured work. At any rate, there can be no doubt (judged by the copies of Esper in our Nat. Hist. Museum, etc.) that the figure of *tiphys*, Esp. [*Die Schmett.*, i., pl. li. (contd. i.), fig. 4], is a ♀ aberration of *A. thetis*, with underside of the *arcuata* type as already noted (*antèa*, vol. x., pp. 343 and 352-353), referred by Ochsenheimer to *coridon* (*Die Schmett.*, i., pt. 2, p. 29), the error copied by Keferstein (*Stett. Ent. Ztg.*, 1851, p. 308), by Staudinger in his *Catalog*, 1st ed., and repeated in the 2nd and 3rd ed. of the latter work, and then



resurrected by Bartel as an ab. of *A. coridon* (*Ent. Zeits. Guben*, xviii., p. 114). The recent authors, therefore, who have referred the figure of *tiphys*, Esp., to *A. coridon*, are entirely wrong in their identification. The aberration, which Gerhard twice figures (*Mon.*, pl. xxxii., fig. 4; pl. xxxviii., fig. 4), appears to be a very common one in most parts of Europe; indeed, it is difficult to capture any considerable number of specimens in some localities without finding this form. Occasionally the two lower spots of the submedian series unite with the lower basal spots, as in *Agriades thetis*, *Polyommatus icarus* and other allied species, in both sexes, forming a double arch (*biarcuata*). We have examples of *parisiensis* in our collection from widely different localities, Fontainebleau (♂ and ♀), Weesen Marsh (♂ and ♀), Arolla (♂), Allos (♀), Gex (♂). In Britain, it is common at Cuxton, Dover, Bevingdean, and the Brighton district generally, Eastbourne, etc., and Sladen particularly notes it as occurring in the form *tithonus* (*syngrapha*) in Wiltshire. Prideaux records it as being not rare in the Isle of Wight in 1895, sometimes occurring only on one side. It occurs commonly, especially among the ♀s, at Podsused in Croatia (Grund), and is taken at Budapest, Isaszegh, Kocsocz and Eperies in Hungary (Aigner-Abafi), at Giesenerberg, near Hanover (Peets), near Crefeld, on the Mündelheim Dyke, in the Rhine Provinces (Rothke), at Grötzingen in Baden (Gauckler), and in Italy in the Florence district (Verity). Blachier notes (*in litt.*) that ♂s of *parisiensis*, *semiarcuata* and *biarcuata* are common in the Geneva district, and ♀s not at all rare. Keynes notes it as occurring August 19th-21st, 1905, with swarms of the type at damp places on the path in the Binnenthal. A specimen taken at Val Tournanche, August 16th, 1905, is *I-nigrum* rather than *parisiensis*, being quite straight and not arched, another came from the Grand Salève, July 28th, 1904, and a similar one from the St. Gothard, August 3rd, 1907; this seems to occur when the 6th submedian joins the basal, leaving the 7th (lowest) submedian free. From Arolla (♂), Preda (♀), Via Mala (♀), Barcelonnette (♀), Grésy-sur-Aix, etc., we have specimens of the *parisiensis* form on one side and *semiarcuata* on the other. Muschamp notes a ♀ with the forewings of the *parisiensis* form, the hindwings *obsoleta* (= ab. *parisiensis-obsoleta*). It has been supposed by some authors that Gerhard merely intended *parisiensis* for the arcuate underside form of *tithonus* (*mariscolore*), but he figures the underside of the latter as quite normal, and his description (*suprà*) appears to us to show that he only intended to discriminate between the two abs. sent out from France (1) as *mariscolore* from "France" generally, (2) the unnamed arcuate form, chiefly from Fontainebleau. Herrich-Schäffer, however, notes (*Sys. Bearb.*, vi., p. 27) the arcuate underside form as occurring in *syngrapha*, and Berce gives a figure thereof (*Fn. Fr.*, i., pl. vi., fig. 7) as the underside form of *syngrapha*, both without reference, however, to Gerhard's name *parisiensis*. Wheeler says that this arcuate form is common at Royston, where *semisyngrapha* may almost be regarded as racial.

#### LOCAL RACES.

There are few local races of this species outside those found in the Riviera, Spain, and south-western Asia, and those that are described as such appear to be merely special developments of widely-distributed forms occurring elsewhere as aberrations more or less commonly, *e.g.*,

*borussia*, Dadd, is evidently nothing more than *marginata*, Tutt, occurring racially, as at Chur, Igman, etc., and has been already dealt with *anteà*, p. 25; *altica*, Neustetter, which can have no real standing whatever apart from ab. *apennina*, Zell. (see *anteà* p. 23 and our remarks *infra*), etc. We believe *pallescens* to be a racial form, but have no information beyond that noted (*infra*) of this particular form.

*a. var. altica*, Neust., "Int. Ent. Zeits. Gub.," iii., p. 198 (December, 1909).—This form flies in the Alps from 800-2000 metres. It differs from the type in being smaller and lighter, more whitish silver-blue. Thus it approaches the var. *rezniceki*, Bart. The black border of the forewing is narrower than in the type, and often broken up into spots by white scales. The hindwing with fine black border and black marginal spots broadly circled with white. Underside of forewing whitish to cream-coloured, hindwing somewhat darker, with grey to light brown suffusion. The eyespots are generally rather smaller, but often quite as large as in the type. The ♀ is smaller, the ground colour somewhat dusky, the underside paler than in the type. Localities: Moserboden in Salzburg, the Glockner, Dobratsch and Predi in Carinthia, the Ortler and Grödnerthal in South Tyrol, Triglav in Carniola (Neustetter).

So far as the description goes, the specimens here selected appear to be referable to ab. *apennina*, Zell. Wheeler observes (*in litt.*) that "Neustetter's statement that this form approaches var. *rezniceki*, Bart., is unintelligible, as the points mentioned are most unlike the latter." With Wheeler's statement we cordially agree. We have some 400 specimens of this species from the various mountain-ranges of Central Europe under observation, and have no hesitation in stating that under 1600 or 1800 mètres an alpine mountain-form, as such, does not exist. The ♂ specimens from the Alps of Central Europe up to this elevation, offer in size, intensity of colour, width and modification of border, colour of underside, size of ocellated spots, etc., practically as much variation as those in the lowlands; the ♀s also are equally variable, and the underside of both sexes (dependent on locality) often darker than lowland forms. The specimens from the Ortler, between Trafoi and Ferdinandshöhe reach an exceptionally large average (see *anteà*, p. 15), and one would consider Saas-Fée, Col de Forclaz, Bérissal, Macugnaga, whence come some of our largest examples (*loc. cit.*), alpine-localities, at any rate they are all near or above Neustetter's limit of 2000 mètres. All these places, too, give good average-sized, together with occasional small, specimens; certainly from the high mountains, 1800 mètres and above, there are more small examples than occur a few hundred mètres lower, owing to the greater proportion of larvæ that must be badly placed, but with them fine well-developed examples may be found. The only place where we have noticed *coridon* tend to set up a distinct race among the high mountains, has been in the Basses- and Hautes-Alpes in France—above Larche and Abriès—where from 6000ft.-7000ft. elevation the specimens average only about 35.5mm. (against those on the Ortler which average 39.5mm.). Any way, the *coridon* that "fly in the Alps from 800-2000 mètres" have no general racial facies whatever.

*β. var. pallescens*, n. var.—In the British Museum coll. two ♂s of this species, labelled "Hungaria, Leech coll.," suggest a fine racial form. They are very similar to each other, exceedingly pale, the margins almost uniform with the rest of the wing, but wanting in the distinctly greenish scaling that characterises the specimens; in certain lights the margin of the forewing appears slightly fuscous, and there are then the faintest possible traces of the interneural marginal ocellated spots, whilst the hindwing has a well-defined series of marginal ocellations outlined

with white (more faintly inwardly). The underside of the forewings whitish, the marginal marks pale, the submedian, basal and discoidal spots ill-developed, in one example only two of the spots (2 and 3) of the submedian row show; the hindwings fawn in tint, with the orange chevrons moderately developed and the spots better developed than those of the forewings.

These specimens are quite unlike anything else that we have seen. They cannot be Rühl's *graeca*, for, although he notes the ground colour of this form as having a shining greenish-silver gloss, he also states that the margin is blackish-grey without spots. The undersides, however, are similarly somewhat faintly marked. It would be interesting to know more about this race.

γ. var. *nivifera*, Kef., "Stett. Ent. Ztg.," xii., p. 308 (1851). ? *Corydon* var., Girard, "Ann. Soc. Ent. Fr.," ser. 4, v., p. 114 (1865).—Var. *b*, *nivifera*—Pyrenees (Keferstein).

This is all Keferstein writes. We have noticed no specially white form from the Pyrenees. The examples from Vernet, Cauterets, Luz, and Gavarnie, in the British Museum coll., are practically typical. Girard speaks of "a form with the spots on the underside almost effaced, the ground colour uniform grey on the upper and lower wings, with no fulvous lunules, and dots not circled with white; this aberration, only occurring in the ♂s, has been received by M. Berce from the Pyrenees, and appears to be a transition to var. *albicans* of Spain."

#### THE RIVIERAN RACES.

Along the French and Italian Riviera, *A. coridon* appears to be double-brooded. It occurs in some spots in mid-April, apparently continuously for several weeks. It is reported as occurring again later in the year, and Chapman practically proved this point by obtaining eggs at Ste. Maxime, which produced larvæ in a short time, that fed up to maturity during the summer, whilst, in almost all other parts of its range, the eggs laid do not hatch till the following spring, and the insect is single-brooded. We first met with this early Rivieran brood in April, 1903, near Hyères, then again in April, 1905, near Hyères, and at Draguignan and Nîmes during the first week of May, 1905, but only in few specimens. In April and May, 1904 and 1906, Chapman found it in some numbers at Ste. Maxime. The examples that we captured stood in our collection as *meridionalis*, but were undescribed. In 1904, Bartel described a form from the Italian Riviera as *rezniceki*, but his description, although agreeing in some particulars with the specimens in our possession, suggested marked differences which a careful examination of Chapman's material intensified, whilst his comparisons with other forms (for almost all of which he apparently used erroneous names), left one with no clear idea as to what he was describing. Whilst we were recently at work on the subject, we received from Reverdin the MS. of a description of a form that he called *constanti*. The three forms thus known to us appeared to present several broad characters in common, and to differ merely in detail, although these details might be considered important. We were unable to refer the specimens in the long series of *meridionalis* in our collection *en bloc* to either *rezniceki* or *constanti*, indeed, our examples appeared to cover the different ground claimed by each, and to exhibit considerable and marked variation *inter se*. We are, at present, very dissatisfied with our knowledge of the specialisation and localisation of these forms, and suspect that, when the same collector

in the same season gets lengthy series from Hyères, Draguignan, Ste. Maxime, Pardigon, Nice, Monte Carlo, Bordighera, and Rapallo, and institutes a careful comparison, a good deal of overlapping will be found to occur; for what appear to be serious differences in colour, in spotting, etc., when the comparison of specimens from any one of these places is made with utterly different races of the species from far-away countries, may quickly disappear when the allied races are brought in series into juxtaposition. Bartel's comparison of *rezniceki* with the specialised races from Spain and Asia Minor, with which they have nothing in common, is futile; almost equally so is the comparison of these forms with Swiss examples. To determine their value as local races, they want comparing with one another, and with the *A. coridon* of other parts of Southern France and mid-Italy, where, under approximately similar conditions, similar forms are more likely to be found. Both Bartel and Reverdin make much of the specialisation of the upperside ♂ colour of the forms they describe, yet they appear to be almost, or quite, identical with that of our *meridionalis*, and these latter again, are hardly distinguishable in this respect from the ♂ s from Digne, Grésty-sur-Aix, the Verdon Valley, etc. We therefore give the descriptions of these forms, and leave it to the future to discover how far they are racial and why. We may add that as a result of a lengthy correspondence Reverdin suggests that the general racial form *meridionalis* breaks up into two sections locally that may be recognised as—var. *meridionalis*, (a) forma *rezniceki* (pale underside, etc.); (b) forma *constantii* (dark underside, etc.).

a. var. *meridionalis* [-*vernalis*], Tutt, "Ent. Rec.," xxi., p. 299 (1909); "Proc. Ent. Soc. Lond.," p. lxxx (1909). *Corydon*, Tutt, "Ent. Rec.," xvii., p. 215 (1905).—♂. Rather smooth, delicate, but dull, silvery-blue in colour; margin of forewings variable. ♀ with deep grey-brown underside. The spring form of the Riviera race (from Hyères, Draguignan, Ste. Maxime, etc.) (Tutt, *Ent. Rec.*, xxi., p. 299). Of a pale silvery-blue colour, the ground tint quite indistinguishable from that of a very long series of examples taken at Grésty-sur-Aix and other localities in Southern France (in July and August), varying somewhat in glossiness, but apparently never of the bright blue tint not uncommon in specimens found in Britain, the Swiss valleys (Val d'Hérens, etc.), the French Pyrenees, Fontainebleau Forest, and most other Central European localities; the somewhat dull appearance in some examples appears to be due to a thinness of scaling on the outer discal area of the wings, a feature further intensified when the specimens are a little worn; a darkening of the discoidal lunule in the forewings is marked in 42 ♂ s, against 18 ♂ s that do not show it, but in some of the 42 it is so faint as to be hardly discernible. The dark margin of the forewings is on the whole wide, but varies from the almost linear (*angustimargo*) form to the extreme wide (*marginata*) form, in which it extends over the outer third of the wing and along the costa to the discoidal lunule; the *punctata* form is rare; the *divisa* form the most common, a pale grey or whitish dividing line (representing the outer margin of the obsoletely developed interneural ocellated spots) passing through the wide marginal band from the costa to the inner margin; on the hindwings the marginal band may consist merely of a row of well-developed, clearly-defined, pale-cinctured, black spots, whilst, in others, they are contained in a wide black margin that extends some distance towards the disc of the wing, and on its inner edge forms a series of dark united lunules. The colour of the underside of the ♂ s is somewhat variable, that of the forewings usually dark grey (reminding one of that of *A. thetis*), that of the hindwings with a slight tinge of brown in addition; the black spots (including the discoidal of forewing) well-developed, the margins pure white, the marginal ocellations strongly developed, surmounted by strong blackish-grey chevrons on the forewings, and by weak fulvous ones on the hindwings; in other examples the grey ground is suffused with whitish over the discal area of the forewings, leaving it, however, sufficiently grey for the white rings of the ocellated spots to show well, whilst on the hindwings the marginal chevrons are surmounted by white, giving a

somewhat mottled appearance; the fulvous crescents, too, are somewhat brighter; in others, again, the ground colour of the forewings is almost blackish-grey, the hindwings with a considerable amount of brown in the ground tint; a few are paler grey, and both in tint and spotting very like typical Central European *A. coridon*; only some 6 ♂s out of 60 ♂s are of the whitish, mottled form described above, although others are near enough to be difficult to determine as to whether they should be placed here or not. The spotting of the underside comprises examples of *cinnus*, Gerh., *juncta* (viâ *addenda*), *semiarcuata*, etc. The ♀s are deep fuscous-brown in colour, resembling in their brownness ♀s from Susa (Piedmont), the ♀s of var. *hispana*, and being decidedly less blackish-fuscous than the usual Central European ♀ forms; they vary much in the development of the marginal lunules, and include the forms *subaurantia*, *peraurantia*, and *aurantia*. The short black discoidal of the forewings is well-marked, there is often not one noticeable on the hindwings, and there is no blue scaling. The underside of the ♀s is very dark grey-brown, the hindwings scarcely, if any, browner than the forewings; the spots well-developed and clearly ringed with white; one exhibits well the characters of ab. *extensa*, the 2nd-4th submedian spots elongated, the lower half of the discoidal and the upper basal lengthened, whilst the lower basal and the 7th and 8th submedian spots unite into the *biarcuata* form; two others are of the *parisiensis* form, four of the ab. *addenda* in varying degrees, one being well towards the *antico-juncta* form; it is to be further noted that occasionally they bear the complete row of eight submedian spots on the forewings; the marginal ocellations are well-developed, the orange lunules bright on the hindwings, weak on the forewings, in which, however, the grey chevrons are sometimes very strongly developed. The metallic scaling on the underside is well-developed at the base of the hindwings, blue in the ♂s and golden in the ♀s.

It appears that our *meridionalis* comprises examples that are referable to *rezniceki* and others to *constanti*, whilst others seem to fall quite outside either. Most of the specimens from Ste. Maxime and Draguignan agree with those described by Reverdin, but both these places also give examples that correspond with *rezniceki* in the particular pale ground colour of the underside, which forms the essential distinction between the latter form and *constanti* (*teste* Reverdin); in addition *meridionalis* includes ♂s which have the underside ground colour much darker, and the hindwings much browner than that mentioned in either of the other descriptions. Whether, therefore, these various Rivieran forms are really racial or overlap, is a matter for future enquiry. Our remarks on *meridionalis* are based on a series of 60 ♂s and 17 ♀s taken at Ste. Maxime, Draguignan, and Hyères. In no way does Bartel's colour-description of ♂ *rezniceki* agree with that of var. *meridionalis*, which is pale silvery-blue in tint, nor is his reference to var. *apennina* understandable, as there is no special Apennine race of *A. coridon* (see *antea*, pp. 22-23); the forms agree on the whole in having a broad marginal border, but *meridionalis* by no means has this in every case, that of some specimens being very narrow; nor is it, in the latter, bounded by a conspicuous row of whitish arcuate spots as described in *rezniceki*; these frequently, when present at all, divide the broad margin lengthwise, whilst in others they are quite absent. The darkening of the discoidals is far from universal in *meridionalis*, and even when marked they are often very inconspicuous. The marginal spots on the hindwings are large in *meridionalis*, but not so amazingly so as Bartel's description suggests in *rezniceki*. The underside of the ♂s of *meridionalis* is very variable, the colour is occasionally as light as described by Bartel for *rezniceki*, more often like that noted by Reverdin for *constanti*, but frequently much darker than in the latter; the forms agree in the strong development of the metallic blue scaling at the base of the hindwings, and by

the spots being large, although not larger than those from certain Piedmont and French localities; they also agree in the strong development of the dark marginal lunules, but those of the forewings have no orange chevrons in *meridionalis*, and only very weak ones on the hindwings, whilst they are described as an almost unbroken row of red wedge-shaped spots in *rezniceki*. The ♀s appear to be alike in their brown ground colour, but there is often no distinct discoidal lunule on the hindwing in *meridionalis*, nor are the discoidals of either wings edged with pale as described in *rezniceki*; nor in *meridionalis* is there an uniform type in the development of the marginal band of orange lunules on the upperside, the normal variation in this respect being shown in a fair series of examples, whilst in none are the marginal spots edged with white as described in *rezniceki*. The ♀ forms agree again in the strongly-developed spotting of the underside, but the red lunules in *meridionalis* do not appear to be so uniformly strongly developed and brightly coloured as Bartel notes for *rezniceki*; nor do we trace any close similarity between the colouring of these and the Engadine specimens where they appear to vary a good deal. In size our *meridionalis* vary from—♂ s 34mm.-41mm., ♀ s 31mm.-37mm. Bartel gives those of *rezniceki*—♂ s 29mm.-30mm., ♀ s 29mm.-31mm., a difference that can hardly be due to a different mode of measurement (we measure the size of the insect from the apex to centre of thorax  $\times 2$ ). Rowland-Brown notes (*in litt.*) that he has the var. *meridionalis* from Brantes, Vaucluse, taken in May, 1907.

β. var. *rezniceki*, Bartel, "Ent. Zeits. Gub.," xviii., p. 117 (1904); Seitz, "Gross-Schmett.," i., p. 315 (1909); Rebel, "Berge's Schmett.," 9th ed., p. 72 (1909).—The ♂ above lighter than var. *apennina*, pale greenish-blue (greenish-silver); a fine black discoidal line on the forewing; the marginal border of the latter very broad, blackish-grey, lighter than in typical Engadine specimens, not sharply defined inwardly, but bounded by a conspicuous row of whitish arcuate spots; in some examples there appear behind these latter a row of fairly conspicuous blackish spots, which seem to be very finely edged externally with whitish. The hindwings are also very strikingly distinct, in that, in front of the black border a row of black spots is placed, which are three times as large as usual, and have a fairly broad whitish border, in consequence of which they stand out very strongly. In front of this row of spots a blackish-grey clouding, in the form of a narrow stripe, is visible; the central spots are not rarely bordered with red as occurs in ordinary *coridon* ab. *suavis*. The underside fairly light, whitish on the forewing, light grey on the hindwing, the latter with the blue-green much more extended along the inner margin and the base, and more strongly marked than in other forms. The underside is, however, more specially distinguished by the exceedingly strong spotting which gives the insect a very different facies, approaching that of *A. bellargus*; the size of the marginal row of spots is specially striking, but the lunules are also greatly increased in size; the submarginal row of red wedge-shaped spots is also very pronounced, almost unbroken. The white bordering of the spots of the hindwings, which is also fairly broad on the forewings, gives the insect a very light appearance on the underside. ♀. The characters less markedly pronounced, which is the case with other local races of *A. coridon* in this sex, but still the form is distinguishable, being lighter on the upperside than are ♀s from the Engadine, leaning strongly towards brown; the discoidal spot of both fore- and hindwings is noticeable, very slightly bordered with light; an obsolescent marginal band of red spots, edged on both sides with very faint black lunules; hindwings with strong black-bordered red spots; the marginal spots also edged with white. The underside of the ♀ is, as in the ♂, exceedingly strongly marked; the marginal spots, outside the ocellated row, stand out especially strongly; the red wedge-shaped spots are, as in the ♂, exceedingly large and bright, and the red spots are also conspicuous on the forewings; the colouring of the underside is something like that of the Engadine specimens, but the hindwings are somewhat lighter



brown, and with stronger blue suffusion at the base. The ♂ then is specially distinguished by the unusual colouring of the wings, the very large, strikingly broad, light-bordered, marginal spots of the hindwing, and still more by the different underside of the wings, which approaches so closely to *A. bellargus* that one can easily mistake an unset specimen, whose upperside has not been seen, for the latter species. In its colouring, the ♂ inclines towards var. *hispana*, H.-S., but the blue of the upperside is different, the border is darker, and the black discoidal spot wanting, the hindwing on the underside is of a darker ground colour; in the ♀ of var. *hispana*, the discoidal spot on the hindwing does not stand out so strongly; the row of red spots is much stronger, the underside of the forewings darker. The ♀ of var. *albicans*, H.-Sch., is of one shade, much more thickly scaled, and the brown sheen entirely absent; the discoidal spot of the forewing is darker and thicker, but does not stand out so strongly; it has only very weak red spots or none at all; on the other hand, the ♀ of var. *albicans* has a more conspicuous marginal row of black spots than the new form; the underside is equally brownish, the light margin of the spots more indistinct, less conspicuous, the spotting itself is weaker; this is most conspicuously so with the marginal row; the greenish suffusion at the base and on the inner margin of the hindwings beneath, is not perceptible in var. *albicans*. The ♀s of var. *corydonius*, H.-Sch., and var. *caucasica*, Led., have no antemarginal red spots on the forewing, the latter form is also much darker, without discoidal spot on the hindwings, and only very weak dark red spots on this wing; the discoidal spot on the forewing is also much smaller; the underside of the forewing is darker, the spotting conspicuously weaker, most strikingly at the margin. Expanse: ♂ 29mm.-30mm., ♀ 29mm.-31mm. Locality: Rapallo (Italian Riviera), June 1st-10th, 1904; Monte Carlo, June 10th-13th, 1904; also from Bordighera and Nice. Taken by Herr von Reznicek (Bartel).

This description of Bartel's is most confusing owing to what appears to be an entire misapplication of names to the forms with which he attempts to institute a comparison. He certainly fails to recognise *ab. apennina*, Zeller, *hispana*, H.-Sch., *albicans*, H.-Sch., and *corydonius*, H.-Sch., and his references thereto make his comparison worse than useless. His *corydonius* appears to be a mixture of the true *hispana*, H.-Sch., and *olympica*, Led., his *hispana* our *caerulescens*, his *albicans* our *arragonensis*, Gerh., etc. Apart from all these probably erroneous references to races as widely different from the Rivieran specimens as is possible within the species, one wonders what purpose is served by a comparison of forms so utterly unlike. In its broad outlines, one assumes from the description that *rezniceki* is like the other Rivieran forms, yet there is hardly a point laid down as diagnostic, in which *meridionalis*, at least, does not differ. We have already discussed (*antea*, pp. 46-48) most of these points, as far as our material allows. A careful diagnostic description of *rezniceki*, stripped of unnecessary verbiage, is still a desideratum.

γ. var. *vern. constanti*, Reverdin, "Ent. Rec.," xxii., p. 60 (1910).—*Agriades coridon* var. *constanti*, gen. *præcox*.—Upperside: General ground tint less vivid and brilliant than in typical *A. coridon*, this tint is slightly greyish; if one places side by side two series of *A. coridon*, the one of the ordinary form, the second of those from Pardigon, those of the latter appear noticeably duller and more greyish. The forewing generally shows a small black line, more or less well-marked, at the extremity of the discoidal cell; the grey marginal border is broad, and often shows a series of dirty white lunules in its centre. The hindwing is ornamented along its outer margin with eye-spots, which are generally complete, *i.e.*, formed by a large black point surrounded by a whitish ring, which is whiter in the part bordering the black point externally, and is generally blackish-grey internally. Underside: The ground colour, instead of being whitish as in the type, is grey, and of a very marked grey, scarcely at all browner on the hindwings, whilst in the type the two wings differ much from one another as a rule, the hindwing being yellowish, the forewing whitish. The margin of all the wings presents a complete series of black points encircled by white, these eye-spots are on the hindwings surmounted by orange lunules, bordered in turn internally with little black chevrons; on the

forewings the eye-spots are edged internally with chevrons of a dark grey, which sometimes form a continuous blackish band. All the spots on the underside of both wings are very large. These characters are, apart from the dull tint of the upperside and the dark grey colouring of the underside, similar to those of var. *rezniceki*, Bartel, which is distinguished by the discoidal mark of the forewings and the large size of the eye-spots on the hindwings above, and the large spotting beneath; but while *rezniceki* is whiter beneath than the type, the variety of Var is much greyer. As is the case with *rezniceki*, the eye-spots on the upperside of the hindwings are often edged internally with a little fulvous (ab. *suavis*, Schultz). The variety which I have just described shows a tendency to the increase of the black pigment, and the presence on the underside of the ♂s of additional black spots is frequent; of the 92 ♂s which I possess, apart from one ab. *biarcuata* and one ab. *radiata*, 12 specimens have these additional spots, one of these specimens has no fewer than 11 of them. In the ♀s I do not find any special characters so accentuated as in the ♂s, but of these I only possess 12; the only thing that strikes me is the darker coloration of the underside and the less marked difference in tint between the fore- and hindwing than is the case in other races. In any case, the characters of the ♂s seem to me so distinctive and so constant as to indicate that we have to do with a variety which deserves to be distinguished. In remembrance of the entomologist who first studied it, I name it "var. *constanti*, gen. *præcox*." As Mr. Wheeler supposes, it is very probable that, in the localities where this variety flies, *A. coridon* may have three broods in the year. Further, if, in Switzerland, it has only one, it has two at Mentone, as I am informed by M. Balestre. 105 ♂s and 15 ♀s captured April 6th-19th, 1906; April 11th-19th, 1908, at Pardigon, Var (Reverdin).

This is an excellent general description of the Rivieran form as we know it, except that, in the particular that Reverdin seizes as diagnostic, *viz.*, the dark grey colour of the underside, our *meridionalis* comprises individuals from the same locality which are dark grey like *constanti*, and others pale like *rezniceki*. Reverdin further notes that he captured his specimens at Pardigon, on the shore of the Bay of Cavalaire, and the railway-bank near the station of La Croix. He states (*teste* Oberthür) that Constant found the same form at St. Tropez, about 12 kilomètres from Pardigon, and that it was taken by Powell in the Forêt du Dom. It is also said to be the form obtained by Wheeler between Cavalaire and le Canadel, May 6th, 1909. As to the racial value of *constanti* apart from *rezniceki*, Blachier observes (*in litt.*) that "Bartel describes the underside of the latter as tolerably pale, the forewings whitish or greyish-white, the hindwings pale grey," further, that the *rezniceki* that he himself took at Chiavari, May 22nd, 1903, as also those sent by Bartel and Bang-Haas under this name to Reverdin and Rehous had the underside greyish-white in the forewings, and pale yellowish-grey in the hindwings, whilst the specimens captured by Reverdin at Pardigon have the underside dark grey or bluish-grey; sometimes the forewings of the latter are paler than the hindwings, but the undersides of certain specimens have all the wings uniformly dark grey; the grey lunules preceding the antemarginal points of the underside of the forewings beneath are well marked in blackish-grey. As to these being different races, it really appears strange that, in the same district, at the same time, two distinct races should appear. I may add that the spring examples that Reverdin has from Mentone and Nice are of the *rezniceki* form." So far as Blachier distinguishes *constanti*, the difference is reduced to the tint of the ground colour and the dark marginal lunules of the underside. In these two respects *constanti* may be said to agree absolutely with 52 out of 60 *meridionalis*, but differs from 8 which agree with *rezniceki* in ground colour, but with *constanti* in the blackish-grey chevrons and absence of orange.



At Ste. Maxime and Draguignan, therefore, the forms appear to overlap, or to contain the elements from which may be developed the pale-underside *rezniceki*, the dark-underside *constanti*, or something much darker than the latter. We would note that Bartel does not appear to say, as stated above, that *rezniceki* is "whiter beneath than the type," this must be considered simply as Reverdin's rendering of Bartel's "tolerably pale," etc.

#### SPANISH RACES.

*a. var. albicans*, Bdv., "Gen. Ind. Meth.," p. 12 (1840); Dup., "Cat. Méth.," p. 33 (1844); Gerh., "Mon.," p. 17, pl. xxxi., figs. 3a-b (1851);\* Heydrch., "Cat. Lep. Eur.," p. 14 (1851); Meyer-Dür, "Schmett.-Schweiz," p. 86 (1852); Ramb., "Cat. Léop. And.," p. 42 (1858); (?) Mill., "Icon.," p. 84, livr. 2, pl. iv., fig. 2 (1859); Staud., "Cat.," 2nd ed., p. 12 (1871); Kirby, "Syn. Cat.," p. 368 (1871); Lang, "Butts. Eur.," p. 122, pl. xxvi., fig. 8 (1884); Kane, "Eur. Butts.," p. 45 (1885); Rühl, "Pal. Gross-Schmett.," p. 278 (1891-5); Tutt, "Brit. Butts.," p. 166 (1896); Obth., "Etudes," xx., p. 21 (1896); Kirby, "Handbook," etc., ii., p. 91 (1896); Nich., "Ent. Rec.," xiv., p. 12 (1902); Lamb., "Pap. Belg.," p. 239 in part (1902); Spuler, "Schmett. Eur.," 3rd ed., i., p. 66 (1902); Rebel, "Berge's Schmett.," 9th ed., p. 72 (1909); Seitz, "Gross-Schmett.," i., p. 315 in part, pl. lxxxi., d (1909). *Corydon*, Ramb., "Faun. Ent. de l'And.," p. 273 (1839).—*Var. albicans*, Sierra Nevada (Boisduval). *Alis integris*, supra villosis, cinereo albidis, margine externo punctato apiceque nervorum fuscis ( $\sigma$ ); anticis puncto medio nigro, posticis lunulis fulvis-obsoleteis ( $\varphi$ ); subtus albidoluteis lineis duabus e punctis ocellaribus punctoque medio nigris, lunulis fulvis, obsoleteis, anticis fimbria nigro-maculata. This species exhibits the same peculiarity as *dorylas*, but in a less pronounced manner; there are some examples quite whitish with the spots of the hindwings almost entirely effaced; the form is not rare on the hills in the neighbourhood of Granada (Rambur).

This is the beautiful large white local race of Andalusia, named *albicans*, in 1840, by Boisduval, but described at length the preceding year by his friend Rambur. There is an excellent series of  $\sigma$ s in the British Museum coll., labelled "Granada (Ribbe)," "Spain, Leech coll." 5  $\sigma$ s, "Andalusia, Zell. coll.," and we have 1  $\sigma$  and 3  $\varphi$ s also from "Granada." These are true *albicans*, whiter than any other known form of the species, with long, silky hair-scales, resulting in the almost entire absence of any metallic scaling or sheen; the margins weakly-spotted exactly as Rambur describes and Gerhard figures them; the undersides also most obsoletely marked on pale creamy-white ground colour and obsolete orange chevrons. Gerhard's is, indeed, a good figure of this race, except that it does not show its usual large size. Besides Rambur's description, quoted *suprà*, he notes (*Cat. Syst. Léop. de l'Andal.*, p. 42) that "similarly to that of *dorylas*, the colour of *corydon* is modified by the heat in Andalusia, and produces a variety *albicans*, i.e., a greyish-white form, scarcely at all bluish, and with the black portion of the margin of the forewings tending to disappear, the form being common throughout Andalusia." Millière states (*Icon.*, p. 84) that "*albicans* is peculiar in being generally a third larger than ordinary *corydon*, the usual silvery shiny-blue only indicated on the upperside at the base of the wings, whilst the marginal ocellated spots, without fulvous lunules, are less marked on all the wings than in the type form; beneath it is very pale, and the fulvous lunules so well-

\* Although on the title-page of Gerhard's work the date is given as 1853, Heft 1-3 were published in 1850, Heft 4-5 in 1851, Heft 6-10 in 1852. His vars. of *A. coridon* are quoted by Meyer-Dür, whose work was published both in the *Zürich Magazine* and separately in 1852, not in 1851, as erroneously noted in the Nat. Hist. Museum copy of the work from which our previous dates have been taken.

marked in the typical ♂ are scarcely visible in *albicans*. The race appears constant in the Sierra Nevada." Millière evidently did not know of Gerhard's figure, or he would not have added that "the form had not been previously figured. Mrs. Nicholl observed (*Ent. Rec.*, xiv., p. 12) this beautiful form "flying in the scorchingly hot, dry watercourses in the glens below Lanjaron on the southern slope of the Sierra Nevada, between May 22nd and 26th, 1901, where the specimens were hardly distinguishable from the white rocks they haunted." Oberthür observes (*Etudes*, xx., p. 21) that, in Spain, *A. coridon* becomes white, and, in certain cases, has no suspicion of blue in its tint, contrary to the rule in Transcaucasia and Taurus; there are, however, he adds intermediates between *coridon* and *albicans*, which appear to be particularly well-marked in the Sierra de Alfakar, near Granada. In July, 1879, a dozen ♂ *A. coridon* were taken near Huejar; they had a bluish tinge, and were easily distinguished from 24 other ♂s taken at Granada and Alfakar. Oberthür further notes that nine ♂s taken at Escorial, July 29th-30th, 1879, are, except one example in which the forewings are almost as little bordered with black, as in *Polyommatus dorylas* var. *nivescens*, broadly washed with blackish-brown on the outer margin of the forewings; the ground colour of the wings of a silvery greyish-white, sprinkled with blue scales near the base, and not far from the race found at Huejar." This is certainly true of the Huejar specimens, for, in the Natural History Museum, is an example labelled "Sierra Nevada—Côte de Huejar; René Oberthür, July, 1879," quite different from the remaining series of *albicans*, with distinct greenish-white metallic scales not covered with the long white hairs of *albicans*, and with the margin of the forewings more strongly banded, but with the spots indicated. This is in reality nearer Gerhard's *arragonensis* than *albicans* in appearance, and probably bears exactly the same relation to *albicans* that *arragonensis* does to *caerulescens*. This form we would call *transalbicans*.

β. var. *arragonensis*, Gerh., "Mon. Schmett.," p. 17, pl. xxxii., figs. 1a-d (1851); Tutt, "Ent. Rec.," xxi., p. 300 (1909); "Proc. Ent. Soc. Lond.," p. lxxx (1909). *Hispana*, (?) Staud., "Cat.," 2nd ed., p. 12 (1871); Cuni-y-Mart., "Lep. Barc.," p. 18 (1874); Lang, "Eur. Butts.," p. 122 (1884); ? Kane, "Eur. Butts.," p. 45 (1885); Staud., "Cat.," 3rd ed., p. 86 (1901); Chapmn., "Ent. Rec.," xiv., pp. 89, 119, 121 (1902); "Ent. Rec.," xv., p. 37 (1903); xvi., pp. 124, 140, 143 (1904); Bart., "Ent. Zeits. Guben," xviii., p. 114 (1904); Sheldon, "Ent. Rec.," xviii., p. 118 (1906); Seitz, "Gross-Schmett.," i., p. 315 *in part* (1909). *Albicans*, Figueroa, "Ann. Soc. Esp. Hist. Nat.," p. 152 (1901); Lamb., "Pap. Belg.," p. 239 *in part* (1902); Leonh., "Ins. Börse," p. 124 *in part* (1905).—This variety, of which Lederer brought back several examples from Spain, is strikingly distinguished by the underside, which is uncommonly bright and very abundantly marked with ocellated spots. The colour is also different (Gerhard). Gerhard's fig. 1a is a "♂, 35.4mm. in expanse, a pale glossy greenish-cream colour (whitish-green in some copies of the work), with dark outer marginal band divided by a pale median line on forewings; the hindwings with a marginal row of well-developed, pale-margined, interneural spots. The underside (fig. 1b) is dark grey, tinged with brown, the red chevrons on the hindwings well-marked, but there is no red on forewings, only whitish marginal spots; the ocellated spots large, 8 in submedian row of forewings, and 4 between the discoidal and base. The ♀ fuscous-brown, with orange spots on all the wings above; the underside brown, the ocellated spots large, especially 5, 6, and 7 of the submedian row on forewings; the orange lunules strongly marked, almost red on hindwings, but shaded off with black on forewings (Tutt).

It seems almost impossible to believe that Herrich-Schäffer's pl. ciii., figs. 494-5, and Gerhard's pl. xxxii., figs. 1a-b represent the same

race, but this no doubt is so, the amazing difference in the tint of the ground colour, as painted, being almost entirely due to the different angle at which the insects have been observed during the time the colouring was done. We have before us a magnificent series of 36 Aragon and Castilian ♂s, 33 taken by Dr. Chapman, with full data. These divide into two sets (1) 12 labelled "Avila, July, 1902," and 6 labelled "Navalparal, 5. viii. '04," all exhibiting well-defined marginal borders to forewings, and the underside spotting rather weaker than that of Herrich-Schäffer's fig. 495. (2) 1 labelled "Moncayo, 2-5000ft., July 12th-24th, 1903," 4 "Soria, July 25th, 1903," 8 "Albarracin, 28. vii.-6. viii. '01," and 2 "Cuenca, 9-16. vii. '01," averaging a little larger, some with rather paler marginal borders, and the underside distinctly more spotted, more like Gerhard's pl. xxxii., fig. 1b, but with less brilliant red lunules. On the upperside, looked at from above, the wings sloping down somewhat, the ground colour is largely of a delicate blue-grey, with pale lunular interneural patches exactly as in Herrich-Schäffer's figure; when the drawer is held vertically, and so that the light falls directly on the specimens, the ground colour is largely shiny metallic creamy- or bronzy-green (the blue-grey being reduced to a minimum) exactly as in Gerhard's pl. xxxii., fig. 1a. Close examination shows that the shiny creamy-green scales are below the long blue-grey hair-scales, and that the essential difference between the blue-grey *albicans* of Herrich-Schäffer (fig. 494) and the creamy-green *aragonensis* of Gerhard (fig. 1a) is merely due to an excess or defect of the long blue-grey hair-scales, which are ashy-white in the Andalusian *albicans*, Bdv. The best blue-grey examples, therefore, as represented by Herrich-Schäffer's fig. 494 (=ab. *caerulescens*, n. ab.), are merely aberrational *aragonensis*, with an excess of these long blue-grey hair-scales. It may be further noted that the largest specimens of this race are most frequently of the *caerulescens* form, as if increase in size and increase in development of hair-scales usually occurred simultaneously. In our long series we have no example with the marginal band on the forewings as in Herrich-Schäffer's fig. 494, that of Gerhard (fig. 1a) is very characteristic but too dark. As a matter of fact there is considerable variation in the marginal border of the forewing; some are excellently marked with ocellated spots, edged internally with dark interneural lunules (=ab. *punctata*), others have the ocellated spots indistinctly merged in a marginal border the same width (=ab. *indistincta*), others have an increased border in which the marginal spots are indistinctly merged, or are represented only by the inner halves of the pale rings, which in some are made up of a row of curves (ab. *subfusca*), in others appearing as a straight dividing line as in Gerhard's figure (=ab. *divisa*), others, again, have wide dark borders (=ab. *typica*) in which the spots are practically invisible, whilst one has the margin widely extended apically towards the discoidal lunule (=ab. *marginata*). It is worthy of notice that the Avila examples have the darkest margins and the palest and most obsoletely marked undersides, the Navalparal examples, also with pale undersides, coming next; the Moncayo example has a very wide border strongly shaded internally, but there is only a single specimen. Inside the dark margin, whatever its stage of development, the ground colour suggests a series of pale interneural patches. The discoidal lunules are usually (not always) traceable, sometimes distinct, those of the forewings and

hindwings in their extreme forms being indicated as pale spots. There is considerable variation in size, the wing-expanse varying from 34mm.-44mm.; the Soria and Albarracin examples average the largest, although the latter contains the smallest as well as the largest example. It is a most marvellous fact that Staudinger makes *aragonensis* (Cat., 2nd ed., p. 12; 3rd ed., p. 86) a synonym of Herrich-Schäffer's little bright blue ♂ *hispana* (pl. civ., figs. 500-501), hence the remarkable misuse made by collectors of the latter name. Chapman gives (*Ent. Rec.*, xiv., p. 99) some interesting notes of its occurrence (under the name *hispana*) and that of the true var. *hispana* (under the name *corydonius*), noting that the former occurred on limestone at Cuenca, where the blue form was not seen, although they occurred practically on the same ground at Albarracin, but occupied different areas. Sheldon, who also fell into the same error in the use of varietal names, gives (*Ent. Rec.*, xviii., p. 118) further details of its occurrence, noting the pale form in the Guadalaviar valley commonly, with a specimen of the ordinary *coridon* type, and one of the "blue" *hispana* form; it was, he says, also common at Losillo. It is, indeed, very remarkable that an example of the Central European type form occurred in this district. We had hitherto seen no typical specimens from a point nearer this district than the Spanish side of the Pyrenees and the Asturias mountains. The species is already quite changed to the *aragonensis* form at Montserrat.

γ. ab. *caerulescens*, Tutt, "*Ent. Rec.*," xxi., p. 300 (1909). *Albicans*, H.-Sch., "*Sys. Bearb.*," i., pl. ciii., figs. 494-5 (1843); *supp.* p. 27 (1852); Staud., "*Cat.*," 3rd ed., p. 86 (1901); Bartel, "*Ent. Zeits. Guben*," xviii., p. 114 (1904); Seitz, "*Gross.-Schmett.*," i., p. 315 (1909). *Corydon* var. ♂, H.-Sch., "*Sys. Bearb.*," pl. lxxiii., fig. 353 (1843); Oberth., "*Etudes*," xx., p. 21 (1896); Sheldon, "*Ent. Rec.*," xviii., p. 118 (1906). *Hispana*, Tutt, "*Brit. Butts.*," p. 166 (1896); ? Spuler, "*Schmett. Eur.*," 3rd ed., i., p. 66 (1902). *Coerulescens*, Tutt, "*Proc. Ent. Soc. Lond.*," p. lxxx (1909).—A pair of examples received from Mr. Keferstein only differ by their considerably larger size, by the very white blue of the upperside of the ♂. The underside is remarkably pale, the ocellated spots and the reddish marginal lunules very small. Spain (Herrich-Schäffer).

We have already explained that this is merely a form of *aragonensis*, Gerh., in which the long blue hair-scales are in excess, thus to a great extent covering the short brilliant metallic scales that give *aragonensis* its peculiar colour. The Cuenca and Soria examples are particularly characteristic of this form on the upperside, though the undersides are rather heavily spotted; the larger Avila and Navalparal examples have the upperside margins very well-defined, but are much more lightly spotted beneath, and these underside differences are apparently locally constant, so that the var. *aragonensis* and its ab. *caerulescens* exhibit two entirely different forms of the underside locally, both forms being very lightly-spotted at Avila and Navalparal (*sub-ocellata*) more heavily-spotted (*ocellata*) at Cuenca, Soria and Albarracin.

δ. var. *hispana*, H.-Sch., "*Sys. Bearb.*," i., pl. civ., figs. 500, 501 (1843); Rühl, "*Pal. Gross-Schmett.*," pp. 278, 763 (1891-5); Lamb., "*Pap. Belg.*," p. 239 (1903); Leonh., "*Ins. Börse*," p. 124 (1905); Tutt, "*Ent. Rec.*," xxi., p. 300 (1909); "*Proc. Ent. Soc. Lond.*," p. lxxx (1909). *Corydon* var. b, H.-Sch., "*Sys. Bearb.*," *supp.* p. 27 (1852). *Polonus*, Staud., "*Cat.*," 3rd ed., p. 86 in part (1901). *Corydonius*, Chapman, "*Ent. Rec.*," xiv., pp. 86, 119, 121 (1902); Bartel, "*Ent. Zeits. Guben*," xviii., p. 114 (1904); Sheldon, "*Ent. Rec.*," xviii., pp. 97, 99, 118 (1906).—♂. Examples from Spain are sometimes small and vividly coloured as in *supp.* figs. 500-501 (Herrich-Schäffer). Herrich-Schäffer's figs. 500-501 represent a small "♂, 30mm. in expanse; blue in colour; the

marginal band of forewings wide, divided throughout its length by a white line, the outer marginal portion containing a series of interneural white-edged spots; a series of white interneural blotches inside the outer margin on all four wings encroaching on the blue ground colour. The underside dark grey and well-spotted" (Tutt).

Herrich-Schäffer's short diagnostic note (quoted *suprà*) settles definitely his form *hispana*. The wonderful sheen, having the appearance of pale interneural patches just within the dark margin of the wings, so conspicuous in this bright blue Spanish form when viewed with the light falling on it at certain angles, explains Herrich-Schäffer's artistic failure to picture the shades otherwise than as white interneural patches, by means of which we may get an entirely erroneous opinion of the form indicated. Exactly the same erroneous effect has been produced by Herrich-Schäffer in dealing with the quite similar shiny patches in the same position in his figure of *albicans* (pl. ciii., figs. 494-5) = *caerulescens* (*suprà*). Staudinger's remarkable diagnosis and reference (*Cat.*, 2nd ed., p. 12): "Pallidior, marg. post. maculato; an præc. (*apennina*, Zell.) sat distincta?" are quite inexplicable, and Kane's (*Eur. Butts.*, p. 45) "whiter than the type, with marginal border broken up into patches; a trifling var.," is equally unsatisfactory, whilst Staudinger's further reference of *aragonensis*, Gerh., as a synonym to *hispana*, H.-Sch. (*Cat.*, 3rd ed., p. 86) completes the muddle. There are only four examples in the British Museum coll. of this exceedingly beautiful and variable race; we therefore note the following points from Dr. Chapman's magnificent series of 44 ♂s and 3 ♀s from "Tragacete, 18-26. vii. '01," and 2 ♂s "Albarracin, 28. vii.-6. viii. '02." The ♂s vary in size from 31.25mm. to 41.5mm.; the average of the specimens looks small against that of *aragonensis* both in wing-expanse and comparative width; the colour varies between a warm lilac-blue and a bright glossy *hylas*-blue; the fringes are pure white, conspicuously chequered with black on the forewings, inconspicuously on the hindwings (sometimes with the black streaks quite absent); the nervures covered with blue scales medially, black on the outermargin, less marked on the hind- than on the forewing; the black marginal border of hindwings narrowing, carrying a series of interneural black spots edged externally with white; the marginal border of the forewings variable and modified in appearance by direction of light, (1) a series of interneural black spots attached to fine marginal line, (2) a similar series faintly edged with grey, (3) a border just wide enough to absorb the hardly traceable spots, (4) a similar border with no spots observable, (5) a wider band with the marginal row of spots, the paler inner edges of which unite to form a greyish line dividing the band throughout its length as in Herrich-Schäffer's figure. (The only example that shows this is the "Albarracin" one.) Inside the marginal band the blue colour has a brilliant sheen in certain lights, making it appear as if the margin is internally edged with a series of pale interneural blotches. (Hence Herrich-Schäffer's white patches here.) The underside of the forewings whitish, the hindwings more yellow; the spotting large and well-defined, showing most of the usual aberrations in the basal spots—ab. *quadripuncta*, *tripuncta*, *unipuncta*, etc.—the union of the basal and submedian ab. *parisiensis*, ab. *semiarcurata*, etc. We have, therefore, in var. *hispana*, a whole series of colour aberrations; warm lilac-blue=ab. *lilacina*: the type (blue with a slight tinge of red); bright glossy blue=ab.

*coelestis*. These, again, subdivide in size into *lilacina-minor*, *hispana-minor*, *coelestis-minor*, *lilacina-major*, *hispana-major*, *coelestis-major*, etc., and then marginally into *lilacina-punctata*, *lilacina-marginata*, etc., *coelestis-punctata*, *coelestis-marginata*, etc., whilst these, again, on the undersides may show ab. *parisiensis*, ab. *semiarcurata*, etc., or they may have white fringes, ab. *albojmbriata*. It is, therefore, as is *aragonensis*, a distinct race, undergoing almost exactly the same aberrational modifications as the type. The ♀s are of a deep fuscous-brown, with discoidals of forewings well-marked, the marginal band of hindwings spotted with red lunules, the spots of the forewings ill-defined and vaguely outlined in grey, the fringes creamy, chequered strongly with brown, especially on forewings; the underside pale brownish, the hindwings are a little deeper ochreous; the spots well-marked and distinctly ringed. The underside of one specimen is similar, except that the median area of the forewings is pale, the discoidal 8-shaped, the right forewing with extra spots (=ab. *addenda*), the left normal.

#### RACES OF ASIA MINOR AND SYRIA.

a. var. *caucasica*, Led., "Ann. Soc. Ent. Belg.," xiii., p. 23 (1869-70); Staud., "Cat.," 2nd ed., p. 12 (1871); Kirby, "Syn. Cat.," supp., p. 767 (1877); Rom., "Mém.," i., p. 52 (1884); Lang, "Butts. Europe," p. 143 (1884); Kane, "Eur. Butts.," p. 45 (1885); Rühl, "Pal. Gross-Schmett.," p. 278 (1891-5); Tutt, "Brit. Butts.," p. 166 (1896); Obth., "Etudes," xx., p. 20, pl. iii., fig. 29 (1906); Staud., "Cat.," 3rd ed., p. 86 (1901); Lamb., "Pap. Belg.," p. 239 (1902); Leonh., "Ins. Börse," xxii., p. 124 (1905); Seitz, "Gross-Schmett.," i., pl. 81 e (1909). *Polona*, Led., "Wien. Ent. Monats.," viii., p. 166 (1864); Staud., "Hor. Soc. Ent. Ross.," xiv., p. 244 in part (1879). *Corydonius*, Neust., "Int. Ent. Zeits. Gub.," iii., p. 198 (1909).—*Lycæna corydon*, Scop. var. *caucasica*, Led. (= *polona*, Led., *Wien. Ent. Monats.*, viii., p. 166 non Z.). I have received from Haberhauer this variety in abundance; it has the blue tint of *daphnis*, the black edging is very narrow, or indicated merely by some black scales, the fringe faintly chequered or uniformly white. This form differs further from var. *corydonius* by the shade of the blue, which is milky in *corydonius*; the shape of the wings and the ♀s conform with the type. *Polonus*, Zell., has the same shape of wings as *bellargus*, the same shining blue, and a wide black border which enlarges somewhat on the costa. Nordmann cites *corydon* amongst the species of the Caucasus without indicating any varieties (Lederer).

This is the beautiful, large, smooth-looking bright blue form of *A. coridon*, with narrow border to forewings, and interneural spots on the hindwings, although a slightly darker shading is noticeable in certain lights, suggesting a rather wider margin in some specimens. Lederer first noticed this form as *polona* (*Wien. Ent. Monats.*, viii., p. 166) in an article describing the insects collected at Kutair and Abastuman in Imeretia (Caucasus) by Haberhauer and his wife, and at Helenendorf (Caucasus) by Kindermann. These *polona* were among the former, but Lederer had no dates, and did not know from which of Haberhauer's two localities they came. Some of Lederer's own specimens are in the British Museum coll. (individuals of which have come through the "Zell. coll."), and these latter, strangely enough, are labelled "*polona*, Caucasus" by Zeller himself. They certainly do bear some superficial resemblance to Zeller's "type" specimen of *polonus*, but are seen to be widely different when carefully compared. Lederer's statements (*suprà*) that *polonus*, Zell., has the same shape of the wings as *bellargus*, and the same shining blue, are not very accurate, as one sees by comparison. Staudinger (*Cat.*, 2nd ed., p. 12) first described the *caucasica* form as "colore cæruleo; Armenia," and in his

3rd ed., p. 86, "cærulea; Armenia, Pontus orientalis." Oberthür notes (*Etudes*, xx., p. 20) that the form known as *caucasica*, Led., is of a more unpolished and less brilliant blue than that of *adonis*, and is distributed in Syria and Transcaucasia.\* The Borjom examples in the British Museum coll. are very large, and much nearer *thetis* (*bellargus*) in tint than any other examples of *A. coridon* examined. Rühl notes (*Pal. Gross-Schmett.*, p. 278) "the ♂ as being of a more sky-blue ground colour, with very narrow black border, which almost always has the appearance of a line only. The spots at the border of the hindwing much smaller than in the type. The rings, which on the underside surround the discoidal lunule and the eye-spots, are on the average larger, and the red bordering of the hindwings lighter. Locality—the Caucasus, Armenia." Neustetter notes (*Int. Ent. Zeits. Guben*, iii., p. 198) under the name *corydonius*, an Armenian ♀ with the violet-blue colour of the ♂ (parallel, therefore, one supposes with *tithonus*, Meig.) which he names *caerulea*.

β. ab. *ossmar*, [Hdnrch., "Cat. Lep. Eur.," p. 14 (1851)†;] Gerh., "Mon.," p. 17, pl. xxxi., figs. 4a-c (1852); Kirby, "Syn. Cat.," p. 368 (1871).—*Caucasica*, Seitz, "Gross-Schmett.," i., 315, pl. (1909).—Var. *ossmar*, Bischoff. Turkey. This variety, occurring likewise only very rarely, I received through Bischoff, who took it in Turkey (Gerhard).

This is a mere aberration of ♂ *caucasica*, noted in Lederer's original description of that form (*antea*, p. 56) as "having the marginal border of the forewings indicated merely by some black scales." These are usually in the form of interneural dots, as in the hindwings, but the dots take rather a blotched form by union with the outer marginal line, although in some quite distinct and separate from the margin. The hindwings are exactly as in var. *caucasica*. The ♀ *ossmar* as figured by Gerhard, is brown with discoidal spots, but no fulvous lunular markings on forewings; orange-coloured lunular markings appear, however, on hindwings.

γ. var. *corydonius*, H.-Sch., "Sys. Bearb.," supp. figs. 595-6 (1843); supp. text, p. 27 (1852); Kef., "Stett. Ent. Ztg.," xii., p. 308 (1851); ? Gerh., "Mon.," xxxvi., fig. 3a (1852); Staud., "Cat.," 1st ed., p. 6 (1861); 2nd ed., p. 12 (1871); Kirby, "Syn. Cat.," p. 368 (1871); Lang, "Butts. Eur.," p. 143 (1884); Tutt, "Brit. Butts.," pp. 166, 168 (1895); Staud., "Cat.," 3rd ed., p. 86 (1901); Lamb., "Pap. Belg.," p. 239 (1902); Leonh., "Ins. Börse," xxii., p. 124 (1905); Seitz, "Gross-Schmett.," i., p. 315 (1909). *Polona*, Gerh., "Mon.," p. 21, pl. xxxvii., figs. 4a-b (1851); Staud., "Cat.," 2nd ed., p. 12 (1871); "Hor. Soc. Ent. Ross.," xiv., p. 244 *in part* (1879); Rühl, "Pal. Gross-Schmett.," p. 276 (1891-5). *Polonus*, Led., "Ann. Soc. Ent. Belg.," xiii., p. 23 (1869-70). *Caucasica*, Holtz, "Ill. Zeits. für Ent.," ii., p. 47 (1897).—*Corydonius*, Kef., suppl. figs. 595-6, from Turkey, must be as good a species as *polonus*. The blue differs from that of both (*corydon* and *polonus*); the black border of the forewings is as wide as in *polonus*, but carries large black spots between the nervures on the hindwings; the spots are as in this species, but the marginal line forms a more noticeable angle at the 2nd nervure, and does not enter in such sharp points between the interneural spots. The fringes of the forewings are very strongly chequered with black. The underside agrees entirely with my fig. 353,† except that the forewings are more whitish, and the marginal spots of the hindwings larger, whilst the black pointed hooks

\* There is no doubt that the ♂ noted (p. 20) as being captured at Vernet-les-Bains, and figured pl. iii., fig. 29, and the other taken at Cauterets in July, 1882, are two more examples of true *A. hybr. polonus*, Zell.

† Heydenreich's work (dated 1851) quotes the name *ossmar* as Kindermann's, while Gerhard, writing in 1852, gives it as Bischoff's (Wheeler). These are, of course, MS. names.

‡ Fig. 353 represents a ♂ *A. coridon*, underside with dark forewing and yellow-brown hindwing. Forewing with three basal spots. All the spots rather small, no black centre to the discoidal of the hindwing, the lower corner of which joins the white streak (Wheeler).



above them are finer. South Russia (Herrich-Schäffer). Herrich-Schäffer's figure measures 39.6mm.

This is another somewhat slight modification of var. *caucasica* (as might be assumed from Herrich-Schäffer's locality of South Russia), in that the marginal border of the forewings is somewhat wider and blacker than in the latter form, a character that appears to become racial in the more southern parts of Asia Minor; it is the *polona* of Staudinger (*Cat.*, 2nd ed., p. 12) which he diagnoses as "al. ant. marg. latiore, al. post. mac. margin. nigris. As. Min. (Mont.);" whilst it is again diagnosed (*Cat.*, 3rd ed., p. 86) by Staudinger as "violaceo-cærulescens; Pontus, Taurus," under the name *corydonius*; there is no doubt that it is also the *polonus* of the same author (*op. cit.*) so far as the description "Al. ant. marg. latiore, al. post. maculis marginal. nigris," and the locality "Taurus" is concerned, thus explaining his remark "*corydon* var. *causicae* valde similis." There are only one or two examples in the British Museum coll., one labelled "'Taurus—Külek, from Led.,' 'Zell. coll.,'" and another "coll. Led." only. In almost all the other bright blue Asiatic examples, in the British Museum coll., the dark marginal edge of the forewing is either very narrow, or made up of vague, interneural blotches, with the appearance of small modified spots. Gerhard's pl. xxxvi., fig. 3a, is a ♂ of bright lilac-blue colour, with very black marginal spots on hindwings, and very black outer margin on forewings, much more contrasted than in his *ossmar*: the underside with the ground colour "uniform brown-grey, the spots well-marked and white-margined; the orange chevrons only on the hindwings. Holtz describes (*Ill. Zeits. für Ent.*, ii., p. 47) this insect, under the name of *caucasica*, as the local form occurring in Cilicia, flying at a height of from 700m. to 1200m., in two broods, the first in May, the second in August, the ♀s of the second generation distinguishable by means of the more strikingly marked red lunular marginal spots. Lederer also found only this local form. Rühl describes (*Pal. Gross-Schmett.*, p. 276) this race, under the name *bellargus* var. *polonus*, as having "the apical angle of the forewing as sharp as in *coridon*, the hind-margin little bowed, the anal angle still less rounded; the knob of the antenna black on the outer side, reddish-yellow at the tip only; the blue of the upperside quite distinctive, less inclined towards white than in *damon* and *coridon*, and with a more silver-grey gloss than in *hylas*: the discoidal spot is quite obliterated by the ground colour, the black border as broad as in ordinary German *coridon*: on the hindwing it is even broader, at any rate on the apical half; the underside is far darker than in *coridon*, light ash-grey on the forewing, more brown-grey on the hindwing; the arrangement of the spots is as in *coridon*, but the spots themselves are larger, those of the median rows regularly rounded, their broad white margins standing out much more conspicuously in consequence of the darker ground colour; between the base of the forewing and the discoidal are two black spots, the row beyond the discoidal consisting of six spots on the forewing and seven on the hindwing, the last of which is made up of two joined together. Locality—the mountains of Asia Minor."

♂. var. *syriaca*, n. var. *Polonus*, Staud., "*Cat.*," 3rd ed., p. 86 in part (1901); Nich. and Elw., "*Trans. Ent. Soc. Lond.*," p. 93 (1901); Fountaine, "*Ent.*," xxxv., p. 98 (1902). *Bellargus*, Nich., "*Ent. Rec.*," xiii., pp. 207, 209 (1901).—Closely allied to var. *caucasica*, but rather smaller; the ♂s of the same tint of blue, but of a rather more metallic appearance; the margin narrow, sometimes with pale interneural shades; the ♀s slightly scaled with blue.



This is the Lebanon form of *A. coridon*, included by Staudinger in his little mixture labelled "*polonus*" (*Cat.*, 3rd ed., p. 86), and hence recorded as *bellargus* by Mrs. Nicholl (*Ent. Rec.*, xiii., p. 207), where she says that she captured it on June 9th near Hasbeyah, in the Hermon district, by a nice spring in the chalk-hills. The same specimens are recorded by Elwes (*Trans. Ent. Soc. Lond.*, 1901, p. 93) as *polonus*, and are said to have occurred "in the Lebanon and Antilebanon commonly between 3000ft. and 6000ft." Of them Elwes remarks: "Staudinger refers the form found in the Lebanon to var. *polonus* . . . . Mrs. Nicholl's specimens differ from the type of *A. bellargus* in their colour and broader border above, and are apparently quite as near the Caucasian form of *A. coridon* as they are to *A. bellargus*. The underside, though paler than in *A. bellargus*, seems more like that than *A. coridon*." Miss Fountaine found the same form between Bsherreh and the Cedars of Lebanon, June 4th-11th, 1901, where it was fairly common in the dried-up bed of a stream; the ♀s, however, were rare, and only two specimens were captured. She adds (*Ent.*, xxxv., p. 98): "In calling it *polonus*, I am submitting to the superior knowledge of Mr. Elwes and Mrs. Nicholl, for it seems to me to approach much more nearly to *A. coridon* than *A. bellargus*, and to answer exactly the description (? Staudinger's) of var. *corydonius*, H.-Sch."

*e. var. olympica*, Led., "Verh. zool.-bot. Gesell.," ii., p. 36 (1852); Kirby, "Syn. Cat.," p. 368 (1871). *Corydonius*, Led., "Ann. Soc. Ent. Belg.," xiii., p. 23 (1869-1870); Staud., "Hor. Soc. Ent. Ross.," xiv., p. 245 (1879); Rühl, "Pal. Gross-Schmett.," pp. 279, 763 (1892-5); Tutt, "Brit. Butts.," p. 168 (1896); Fountaine, "Ent.," xxxvii., p. 157 (1904).—The var. *olympica*, from the Olympus near Brussa (perhaps referable to the var. *osmar*, Heydnreh., which is not particularly described), is distinguished by the pale milk-blue colour of the ♂; it also has a *mariscolore* form of the ♀, parallel with the French silvery-green *mariscolore* form of the ♀, but the Turkish local ♀ aberration has entirely the pale milk-blue colour of the ♂ (Lederer).

There is a good series of this beautiful form in the British Museum coll. labelled *corydonius*, evidently owing to a blind following of Staudinger, who (*Cat.*, 2nd ed., p. 12; 3rd ed., p. 86), having described *corydonius* as "violaceo-cærulescente," referred erroneously the "pale milk-blue," or rather lavender-blue, *olympica*, Led., to *corydonius* as a synonym, together with *osmar*, Gerh., apparently merely because they all came from "Turkey-in-Asia," or as Staudinger puts it, "Asia Minor mountains" (2nd ed., p. 12) and "Pontus, Taurus" (3rd ed., p. 86). Rühl describes (*Pal. Gross-Schmett.*, p. 278) his *corydonius* ♂ from the Tokat Alps, in Lederer's words "milk-blue," and adds as further localities (p. 763), "Kerasdere (July, August), Caraman, Brussa (commencement August)." Miss Fountaine also records it (*Ent.*, xxxvii., p. 157) under the name *corydonius*, and states that she took her first specimen at Tokat, July 13th, but did not see any more till she returned to Amasia (about July 17th), but it was not at all common, and only two ♀s and about ten or twelve ♂s were taken altogether. The specimens in the British Museum coll., which we should describe as being of a very pale lavender tint, are well-spotted beneath, and those from "Shar Deresy—N. Syria," are exactly like those labelled Smyrna, Amasia, Külek, etc. [This "Külek" labelled specimen is interesting, as, if correctly labelled, it shows that the pale lavender *olympica* here overlaps the bright wide-margined *corydonius* (see *antea*, p. 58)].

EGGLAYING.—A ♀ was observed on August 12th, 1900, at Abriès,

about noon, on egg-laying intent. She flew to a plant, rested very quietly for a minute or so, moved her hindwings backwards and forwards very quickly for a moment, curved her abdomen, and then flew off. I picked the leaf and found the very pale green egg at once (see *Ent. Rec.*, xii., pl. xi., fig. 2). The ♀ continued to act in a similar manner, and several times appeared to rest as if about to lay another egg, but no other was observed to be laid (Tutt). W. B. Davis states (*in litt.*) that, in August, 1905, he procured several ova by closely watching the ♀s when ovipositing, the eggs being laid singly and near the base of plants of *Hippocrepis comosa*; the ♀, after alighting, usually crawled for some distance through the herbage, till it reached a plant, when, pushing its way as near the rootstock as possible, it bent its abdomen under and thrust out the ovipositor, affixing the egg to whatever it came in contact, more often the stem or a lower leaflet of the foodplant, although Davis adds that he witnessed two eggs laid in this way on grass stems. Rayward says (*in litt.*) that the egg is usually laid on or near a plant of *Hippocrepis comosa*, frequently, and perhaps most usually, on the underside of a leaf, but the ♀ does not always restrict herself to the foodplant when ovipositing, and, if an egg or two be found on the leaves, others will probably be discovered on stalks of dried grass and other herbage growing close to the ground around the roots of the foodplant. This is so frequently the case that one supposes that the egg stands a better chance of surviving when attached to grasses and herbage that do not decompose, than when laid on the *H. comosa*, which dies down during the winter. When first laid, the egg has a dull greenish-white ground colour, overlaid by a beautiful tracery of white crystalline network, dividing the surface into a large number of irregular-sided cells; in the course of a day or two the green shade fades away, and the surface becomes a pale, dull white; in this condition it passes the winter, and hatches towards the end of April or beginning of May. Chapman observes that, in laying her eggs on a plant of *Hippocrepis* that grows on comparatively bare ground on the Riviera, the plants lying flat on it and spread as a circular patch, but which also grows amongst other plants, the ♀ alights as nearly as she conveniently can to the centre of the plant, turns round and creeps down, sometimes her own length, sometimes two or three times as much, till she is close to the ground, or, by the tangle of plants, cannot go any further; then, rather by backing than by turning round, she gets the ovipositor deep in the plant and near the ground, and lays her egg on the underside of leaf or stem; twice eggs were laid on weak shoots a few millimètres long, in the centre of a plant that had trailing stems of many inches, in another under a leaf close to the ground and under the foliage, in a fourth instance it was laid on the stem of a little seedling *Helianthemum* that happened to be struggling upwards in the centre of the papilionaceous plant. Plants being abundant, only a few inches quiet flight took the butterfly from one to the next; twice a laying ♀ was noticed to fly off, once to rest on the ground, in the other case to visit a flower. It is difficult to watch the butterflies, and spot and find the eggs, so that the four noted above were the only ones found. As so much care is taken by the ♀s of the early brood on the Riviera, whose eggs hatch at once, one would expect that the eggs that have to pass over the winter would be even more carefully

placed centrally and low down ; probably the instinct is identical in both broods. In confinement, the butterflies would not lay on plants in water, but laid freely when the plants were laid flat on the bottom of a box ; all the eggs were laid low down, and nearly all underneath stems and leaves, and close to the bottom of the box. Zeller states (*Stett. Ent. Ztg.*, 1852, p. 42) that he twice observed a ♀ egg-laying ; on the first occasion the egg was laid on a small stem of moss, the other on a fallen pine-needle near the *Coronilla*. He adds that he thinks it probable that the egg does not hatch till the following spring, the first hint of the real hybernating-habit in Central Europe, which we were able to confirm, in the case of a single egg in the winter of 1897-8. Wood notes (*in litt.*) that, in confinement, ♀s lay freely either on the underside of the leaflets of *H. comosa* or, more frequently, on dried moss which he always provided in addition ; the eggs go over the winter and hatch the last week in March or the first week in April, according to the forwardness or lateness of the season. Frohawk observed (*Ent.*, xxxiii., p. 300) several ♀s ovipositing, on August 13th, 1900, on various stems of the usual stunted herbage to be found growing on chalk-downs ; they frequently crawled among the plants for a distance of about a couple of feet, occasionally curving the abdomen downwards among the small plant-stems and grasses, and here and there deposited an egg. In confinement, on the 14th and 15th, ♀s placed over a piece of potted turf, laid eggs on dead trefoil leaves, as well as on living leaves, but the site generally chosen was among the intermingled stems of plants and grasses ; another ♀, placed upon a similar pot of plants, deposited about 50 ova on September 10th, nearly all being placed upon the stems, but a few on the underside of the leaves, of rock-rose ; in all cases the eggs were deposited singly. Chapman noted (*in litt.*) some English eggs as looking healthy, but still unhatched March 8th, 1907, but the eggs that he obtained, laid in April, 1907, at Ste. Maxime in the south of France, soon hatched, two on May 5th, another on the 6th, three more on May 7th, and so on ; a later observation is to the effect that, on February 22nd, 1910, he received several eggs of *A. coridon* that had gone over the winter at Dartford, from L. W. Newman, several young larvæ having hatched on the way ; on the morning of February 23rd, 125 had hatched, on February 24th rather more than 60, on February 25th, 30 more, on February 26th the last one was found with the egg-shells and various dried eggs. It would seem from this that once the larvæ inside the eggs have satisfied their instincts for hybernation, they are ready to hatch on the first suitable rise of temperature to which they are submitted. It is probable that, naturally, the same rise of temperature that hatches the larvæ has already started some growth of the foodplant, and it appears evident, from the habit of these newly-hatched larvæ that, if they have unluckily hatched a little too soon, they can keep themselves alive by nibbling any available old and tough leaves they may find. Noad-Clark observes (*Proc. Sth. Lond. Ent. Soc.*, 1900, p. 50) that an egg laid at Abriès, August 12th, 1900 (figured *Ent. Rec.*, xii., pl. xi., fig. 2) hatched September 14th, 1900. One wonders whether this is an error of observation, as it is well-known that the species uniformly hybernates in England and Central Europe as an egg.

**OVUM.**—The egg forms a flattened disc with a quite flattened base

about .60mm. wide, .30mm. in height; viewed laterally, it has the outline of a flattened cheese with rounded edges; viewed from above, there is nothing of which I can think that the egg so closely resembles as the well-grown blossom of a double dahlia with flattened centre. It is of a pale green colour when first laid. The micropyle forms a depressed area in the centre (at the apex), and is composed of rings of the very finest rounded cells, arranged concentrically. This area is of a rather darker green than the general colour. Around this, and over the greater part of the upper (and still somewhat depressed) area of the egg, the cells assume a roughly quadrangular and polygonal (mostly pentagonal) form, arranged concentrically, and increasing in size from the micropylar area outwards, the edges of the cells being formed of fine raised silvery-white lines. Outside this area, *i.e.*, covering the outer portion of the upper part of the egg and the sides, there are (viewed from above) five rings of squat pyramidal-shaped elevations of bright silvery-white colour, from the apex of each of which six (or seven) curved silvery lines run down, until they meet the similar curved lines coming from the adjacent elevations, so that under a moderately high power, each of these lateral cells has separately the appearance of a distinct support with six concave radiating cables curving from the summit. There are three rings of these cells on the sides. The appearance of these raised points and their attachments is very remarkable and beautiful, and looks like whitest spun glass or filigree-silver (Tutt, August 22nd, 1897). [The egg is figured ( $\times 20$ ) *Ent. Rec.*, xii., pl. xi., fig. 2.] Diameter of egg .60mm. (Reigate), .70mm. (Ste. Maxime), height .28mm. As seen by the naked eye or with a hand lens, the top of the egg has the appearance of being very flat and level, as if treated with a steam roller, the pattern is there, but only when the side that escaped the steam-roller is reached do the raised points at the angles of the network assert themselves; on a higher magnification, the central (micropylar) area appears as a small dark centre, a little sunk, with very fine reticulation, in width about one-eighth that of the egg; outside this is the white flat top, in width about three-quarters that of the egg, with fine reticulation, the meshes smallest centrally; counting a little diagonally, *i.e.*, on the spiral of the engine-turning pattern, there are twelve cells from centre (outside micropylar depression) to where the angles become raised on the outer slope; outside this, *i.e.*, on the rounded edge, the mesh is distinctly well marked, the lines being, as it were, hung in a curve from one point to the next. These points are prominent and white, and related to six surrounding points, to each of which a line or rib runs; the result, as seen on a side view, is most regular and pleasing, and looks as if sculptured out of snow. There are four points from above down, counted vertically, six counted on the diagonal (Chapman). Gillmer has described the egg exceedingly well (*Illus. Zeits. für Ent.*, v., p. 35), as also did Frohawk (*Ent.*, xxxiii., p. 300) in September, 1900; the latter strangely claimed to have first described it, although a description of the egg was published (*Ent. Rec.*, ix., pp. 262-3) three years earlier, and the egg was exhibited at the South London Ent. Soc. (*Proc.*, S. L. E. Soc., 1897, pp. 139-142), whilst another was figured by Clark (*Ent. Rec.*, xii., pl. xi., fig. 2).

COMPARISON OF EGGS OF AGRIADES THETIS AND A. CORIDON.—The eggs of *A. thetis* and *A. coridon* are very much alike, but the former is

rather smaller, *viz.*, 0.57mm. in diameter, as against .60mm. for the latter, both laid by Reigate examples in August and September. Height of each 0.28mm. The egg of *A. thetis* has a very similar micropylar hollow to that of *A. coridon*, but the network is far from being so fine, can be made out with a much less magnification, and is less definitely marked off from the flat top. The cells of this top are much larger than, about twice as large as, those of *A. coridon*; there are only five cells counted on the spiral, and the marginal raised points encroach one cell further, coming right on to the top, so that, whilst in the egg of *A. coridon* one looks, on a side view, right across the "steam-rollered" plain, in that of *A. thetis* one cannot do so, as it (as well as not being so thoroughly steam-rollered) has a margin of these points rising above its surface; otherwise the side view of the egg is almost the same as that of *A. coridon*; taking a line of points round the egg, they are about 22 in number; they are much the same in *A. coridon*, but this counting is difficult to feel sure of, as the points vary a little, and are also more or less diagonal, not in an accurate circle. The examples selected for above notes, were well-marked ones; it is possible to find eggs of *A. coridon* with say nine cells in line of spiral of top, and eggs of *A. thetis* with six, but in all cases the transition from top to side is more regular in *A. thetis*, more abrupt in *A. coridon*, resulting in a much more pleasing effect in the former egg. The French spring egg of *A. coridon* is more like that of *A. thetis* in the upper surface having the side points encroaching on it, and in the top, therefore, not being so obviously a very smooth plain. The cells counted as in other instances are ten. The side points are taller and thicker, as if the individual ribs ran separately quite to its top (an occasional aspect in the eggs of English *A. coridon* and *A. thetis*) (Chapman).

VARIATION OF EGGS OF AGRIADES CORIDON.—Eggs laid by Reigate ♀s measure .60mm. in diameter, and were .28mm. in height; eggs, however, laid in May at Ste. Maxime, and, therefore, by the spring brood (to produce summer imagines as a second brood, a brood that does not occur in England), are nearly .70mm. in diameter. It is not possible to say whether this difference is between spring and summer eggs, or between the eggs of the English and South France races (Chapman).

HABITS OF LARVA.—Chapman observes (March 5th, 1910) that some 220 young larvæ that hatched between February 22nd-26th were placed on plants of *Hippocrepis*, with leaves old and mature, apparently survivors from the preceding year, and in these they had eaten small round pits; a few had discovered a leaf or two of very small size, but apparently of recent growth, and had fed in the normal way, making a hole and eating out the parenchyma of the leaf through it so as to make minute white-mined patches; these larvæ looked thriving, had grown somewhat, and had obvious green contents. He had previously noted (May 22nd, 1906) that the young larva in its first instar, takes up a resting-place in a leaf-axil of *Hippocrepis comosa*, behind a head of flower-buds, and moves for feeding to a neighbouring small leaf on which it has, on three several occasions, made three several attacks, which are now minute pale blotches, where it has eaten out the parenchyma through a minute hole, after the manner of some Coleophorids. Rayward states that, in its early

stages, the larva eats small round holes through the leaves of its food-plant, but later on devours the entire leaf. Chapman further observes that the larvæ in the second instar prefers leaves of *H. comosa*, but will eat the flowers; those eating flowers are almost ochreous in colour, at least an ochreous-olive, those on leaves have a very dark green tone, both, however, with yellow dorsal and lateral lines; the difference in colour is, at this period, more due to intestinal contents than to differences in the blood-fluid, the larva being very translucent like those of most *Lycænids*. Our own observations were made in confinement, on some larvæ sent to us by Rayward in June, 1909. A small larva, resting on the underside of one of the little leaves of *H. comosa*, is exceedingly well protected, and, as it hangs head downwards and the yellow markings catch the sun, is often well-nigh invisible, nor are the larger larvæ to be discovered easily, especially if resting on a flower-head, with the buds only partly expanded, in which case the dorsal rows of yellow marks and the bright green ground colour is very effective. It is really remarkable how yellow the marginal flanges appear with the light behind the larva as it crawls down a stem or stands among a bunch of flowers, the colour being excellently protective, the more opaque parts of the body look very like the more opaque colour of the leaflet against the light. The larger larvæ get among the thickest herbage, and are then remarkably well hidden, indeed, it is almost impossible to see them until the pulling apart of the foliage tends to make them curl up somewhat or to drop. The larva crawls slowly, and appears to be very lethargic, moving but little all the while it has a good supply of food, but becoming restless and crawling steadily for a considerable distance to find fresh food, if this be wanting. When feeding it keeps its body quite still, moving only its head and prothorax as it takes a leaflet as it were between its true legs and nibbles it from the apex towards the base, until the whole has been demolished; the larger larvæ love the young juicy stems of the foodplant, often nibbling them down for a considerable distance when the leaf is finished. When at rest on a leaf or stem, the venter is very closely appressed to the resting-surface, the dorsum usually facing outwards or downwards, the tips of the yellow projections of the lateral flanges just showing, the larva thus tipped laterally being readily overlooked, unless one moves the little stem or leaflet on which it rests. When disturbed, the larva readily falls to the ground, coiling its head round somewhat and forming a sort of hook, but the head never reaches to the venter, nor does the anal segment appear to curl so much as does the head part; the larva remains in this position for a considerable period, but, when sufficient time has elapsed for any danger to have passed, it pushes out its tiny black head, and, with the peculiar cork-screw movement that the *Lycænid* larvæ favour, turns its head and true legs over towards the ground, when, getting some little hold with its feet, it brings its body over so as to be in a position to crawl. When lying on the ground curled up, the dorsal projections or ridges stand out strongly from the deeply-cut segmental incisions; after being disturbed, it often remains absolutely immovable for a long time—say ten or fifteen minutes—before attempting to move. As bearing on the sluggishness of the larva, we may notice that one smallish larva remained almost immovable for three days, from June 12th-14th, 1909, in a fixed position on a leaf-stalk, appeared,

indeed, as if it had died, and, on removing it, it lay on the ground quite 24 hours longer without stirring. The next morning it was found on a piece of fresh food quite near where it was lying the preceding day, and had evidently already eaten one or two leaflets, but there seemed to be no trace of any cast skin, nor any change of colour, or one might have supposed that it had moulted; we do not believe it had done so. Next morning, June 16th, it was more active and crawled up the stem from its position of the previous night, and between 9 a.m. and 10 a.m. attacked the petals of a head of flowers, but soon changed these for the ovaries, which it slowly demolished. It was interesting to see another rather small larva at the end of a leaf, clear off the terminal leaflets whilst resting along the main stalk, and then curl its body round as it were, to attack the lower leaflets; thus curled it presented a very close resemblance to a faded flower. The head of the larva is quite ventral when feeding; when eating a leaflet it commences at the apex, nibbles it slowly down to the stem, and continues until the leaf is entirely eaten; it does not mind leaves somewhat withered, but appears to prefer a head of flowers, eats away the calyx and the ovary of each flower entirely, leaving the yellow petals to drop, and continues to do so till the ovary of every flower on the stalk has disappeared. The flowers are noted on June 17th as taking on a dull brownish-orange tint, and it is remarkable to observe that, without moulting, some of the larvæ assume this tint in the yellow markings instead of the bright chrome of the earlier period of this instar. They are, indeed, marvellously well protected, yet, when one of the larvæ has finished a meal in the daytime, it usually goes down and hides or rests near or among the roots; a habit strongly developed according to Krodell in nature. As bearing also on this point Rayward tells us (*in litt.*) that, in its later stages, the larva may often be found during the daytime resting on the stem of a leaf about an inch or so above the surface of the ground, and, when discovered in this position, has generally been accompanied by ants. When walking, the movement of the body appears almost imperceptible, and one has to watch closely before one gets an idea of really definite motion. At such times, the little black head, covered by the protruding prothorax, is kept ventrally on a level with the surface on which the caterpillar is crawling, and the prolegs are protruded so little that the venter appears to be practically touching the surface of the ground, yet, if looked at sideways with the eye quite low, it is seen to be well above it. At such time the prothorax looks almost as flat as the anal end (8th-10th abdominal segments), and it would be difficult to tell which is the anterior and which the posterior end of the caterpillar, were it not for the direction of movement, and for the fact that the mesothoracic hairs project somewhat anteriorly, whilst the segmental sections of the double dorsal flange, and of the lateral flanges, both well-supplied with hairs, point backwards. When walking, the legs are moved so that the anal segment automatically rises and falls, the anal prolegs only just touching the surface before being raised again, the movement being quite rythmical; on a level surface the prolegs appear to take no greater part in walking than the true legs, which appear to be as powerful muscularly as the prolegs, and to take a quite equal share with the latter; this rhythmic movement of the anal end reminds one much of a gentle see-saw. The head is put out in a very



enquiring way when the larva comes to a difficult position, or it stretches itself bodily over a space that has to be bridged. The larvæ appear to grow very rapidly in the last stage, in bulk they certainly increase more than twice their size at the commencement of this instar. Wood observes (*in litt.*) that, although in the earlier stages the larvæ may be found feeding freely during the night, yet, in the final instar, they appear to feed for about three hours previous to darkness, and then disappear. Zeller was the first lepidopterist to discover the larval habits of this species, the caterpillars of which, he states (*Stett. Ent. Ztg.*, 1852, p. 425), he found exclusively on *Coronilla varia*. He says the larvæ usually hide concealed during the day, but that rarely, on bright days, he found them on the foodplant attended by ants. Most of the larvæ, however, were found after sunset among the roots of the foodplant; they were especially abundant one year, when the larvæ of *Anthrocera peucedani* were so common that they had eaten down the plants on the hillside quite bare, and the discovery of the larvæ of *A. coridon* was, in consequence, quite easy; after a rainy day, some of the latter were smeared with clay, showing the larvæ were either on, or actually in, the ground, before climbing on their foodplant. He adds that they eat the flower-buds, then the leaves, and even the ends of the stalks, whilst their mode of progression is an even, snail-like gliding, in which the oval shining black head, with its grey horizontal stripe above the mouth, comes somewhat prominently forward. One is most likely to find them fullfed in the second half of June, but since the butterfly has a long period of flight, they may be found even into July. Schmid found the larvæ from April to June in various sizes, mostly hidden by day under flat stones in the vicinity of *Hippocrepis comosa*; Speyer records that he once found a larva beneath the leaves of the foodplant, *Astragalus glycyphyllus*, which produced a butterfly on August 10th; Bartel and Herz make the remarkable statement that "the larvæ live from autumn to June on *Coronilla varia* and *Onobrychis*, and that, during the day, they hide in the sand;" one wonders whence this information was obtained. Koch observes that the larvæ feed on *Coronilla varia* and *C. minima*, are fullgrown at the end of June, and, among tall heath, hide by day below the surface of the ground. Kranz states that the larvæ hide by day on the ground, proceeding only to the foodplant at night. Krodol states (*Allg. Zeits. für Ent.*, ix., pp. 104-106) that he collected several hundreds of larvæ in the Main valley, and noticed it as peculiar that, although the latter district possesses a comparatively warm climate, larvæ sent him from Regensburg were almost double the size of the Main valley ones. He found the larvæ by day, and says that the eaten down ends of the plants of *H. comosa* were unfailing guides, and that, if they were not underneath the stones lying nearest to these, he had only to pull down the heaps of stones collected together from .5 metre to 1 metre high, to find them on the lowest layer of stones close over the damp cool ground, sitting harmoniously together, some near, others on top of, one another. He observes that the larvæ of *A. coridon*, unlike those of *Hirsutina damon*, feed only at night, and, at daybreak, seek as much protection as possible from the sunlight, creeping into any cranny that offered protection, and squeezing themselves through the narrowest clefts; this was fully illustrated by the escape of almost half the larvæ collected, from a breeding-cage which had an almost imperceptible chink in it, a fact



hardly credible concerning an onisciform larva that moves with snail-like slowness. Krodel has no hesitation in referring the hiding-habit to its wish to hide itself from light, stating that exposed larvæ put in the sunlight hide themselves very rapidly. He further notes that, whilst the larva of *Hirsutina damon* is exclusively a flower-eater, that of *Agriades coridon* devours everything on the foodplant which it can grind up with its mandibles—flowers, leaves, and stalks. The first larvæ were found on May 26th, mostly about half-grown, by mid-June most were fullfed, but some were even then not more than half grown, whilst others were quite small, a fact which explains the extended period over which the imaginal period of emergence is spread; in captivity they pupated between June 17th and July 19th, but later than this larvæ in all stages of growth were to be seen, but observation was not continued on the later larvæ. Out of some 1000 larvæ, some 900 succumbed to pébrine.

SYMBIOSIS BETWEEN ANTS AND THE LARVÆ OF AGRIADES CORIDON.—That the larvæ of *A. coridon* were attended by ants, was first noticed by Zeller, who states (*Stett. Ent. Ztg.*, 1852, p. 425) that, on the rare occasions on which he had seen the larva of *A. coridon* on its foodplant in bright days, there were small ants busy around it, or actually upon it, so that he at first supposed the larvæ were bitten by them and driven out of their concealment into the upper part of the plant, but as he found the larvæ were uninjured, and as the caterpillars were bred when attended by ants, to the perfect state, he concluded that no enmity existed between the two insects. A similar observation, Zeller remarks, was made in Fuessly's *Neu Magazin*, p. 384, about *Plebeius argus*, and by Petzold in *Scriba's Beiträge*, p. 232, about *Hirsutina damon* (*biton*). In the latter case an explanation of the phenomenon is sought in the assumption that two very small warts, which are found on the back of the larva of *H. damon*, and can be extruded at will, give out something pleasing to the ants. Zeller adds that he had not noticed his larvæ sufficiently closely to find these small warts which, even if there, would, during their feeding-time, most probably cease to be drawn in and out. Rayward observes (*Proc. Sth. Lond. Ent. Soc.*, 1906, p. 63) that, on June 18th, 1906, at Reigate, he obtained some 30 larvæ of *A. coridon*, almost all of which had specimens of *Lasius flavus* on them, attracted by the dorsal honey-gland. He further notes (*Ent.*, xxxix., p. 197) that two larvæ, resting on two adjacent leaves of a plant of *H. comosa* growing out from the crown of an ant's nest, were literally covered with ants, more than twenty being counted on one of them. The observer obtained, at home, several demonstrations of the ants making use of the honey-gland; one was observed waving its antennæ excitedly, then, finding its way to the gland on the 7th abdominal segment, it stroked it with a rapid movement of the antennæ and first pair of legs; this caused a distension of the gland and a subsequent extrusion of a tiny bead of clear crystal-looking fluid, followed on further solicitation by one or two more drops which were eagerly sucked up by the ants. It was observed that some ants found the honey-gland much more readily than others. He also notes that the two eversible caruncles or "fans" situated near the lateral ridge on the 8th abdominal segment, one on either side, behind and lower than the ninth spiracle, were quickly evaginated and withdrawn, sometimes singly, but frequently both together. Though these tubercles are

supposed to be—and very probably are—scent-organs to attract the ant to the gland, it was noticed during these experiments that they were most active when the larva appeared to resent the attempts of the ant to obtain fluid from the gland, as was sometimes the case. At this time the gland was contracted and withdrawn below the surrounding surface of the segment, and the rapid erection and withdrawal of the tubercles generally resulted in momentarily distracting the ant's attention, causing it to leave the gland, to which, however, it usually quickly returned. He further observes (*in litt.*) that, in its later stages, the larva of *Agriades coridon* prefers to rest in the daytime on a leaf-stalk at about an inch above the surface of the ground, and that, when thus discovered, the larva has generally been accompanied by ants. He also states that, on the afternoon of May 11th, 1907, he found four little larvæ thus resting on a small isolated plant of *Hippocrepis comosa* growing on the top of a small nest of *Lasius flavus*, and so many ants were busy running about and over them, that his attention was at once attracted. On the other hand, Prideaux states (*in litt.*) that he found larvæ common on Reigate Hill in June, 1895, but quite unattended by ants. Wood notes (*in litt.*) that, in his experience, wild larvæ are only attended by *Formica rufa*, although *Lasius flavus* is also to be found in the spots they frequent. Sometimes as many as five or six *F. rufa* are to be found in attendance on one larva, whilst, in one instance last summer, no fewer than twelve were battling on the body of one; they were so close together that the colour of the larva could not be seen, and the whole looked simply a slug-shaped mass of jostling ants. Donisthorpe writes (*Ent. Record*, xix., p. 256) that, having two larvæ of *A. coridon*, he placed them into plaster-nests with glass tops, and introduced separately six or eight examples of each of the following ants to them, *viz.*, *Formica rufa*, *F. sanguinea*, *F. exsecta*, *F. fusca*, and *Lasius fuliginosus*. One *Formica sanguinea* seized a larva and dragged it along a little way, the caterpillar remaining quite rigid, but soon dropped it, and all the ants mostly sat on the larva at different times, tapping the posterior part of the body with their antennæ. He adds that he “left the caterpillars with a species of ant for a week at a time, and put one into a *F. rufa* nest itself, where it crawled about among hundreds of ants without coming to any harm.” Krodell states (*Allg. Zeits. für Ent.*, ix., pp. 104 *et seq.*) that, at Würzburg, in the Main valley, he always found the larvæ by day exclusively under stones in the neighbourhood of *H. comosa*, and in all cases in the company of ants. Stones which, on being turned over, showed no ants, afforded no larvæ of *A. coridon* either. As a rule it was the common *Formica nigra*, more rarely *F. rufa*, which sought the *A. coridon* larvæ; with the small yellow *F. flava* (*Lasius flavus*), he never found any.

LARVA.—*First instar*.\* When newly-hatched the larva is of a

\* An ovum opened on January 4th, 1908, disclosed an almost fully developed larva about 1mm. long and yellowish-white in colour. The head rather dingy ochreous, and the parts withdrawn within the prothoracic segment showing through the dorsal surface of the latter leaden-grey. The thoracic legs very pale shining ochreous, and bearing a number of short, pointed, white hairs; the claws fully formed, ochreous, with a shade of red-brown. The abdominal legs difficult to define, and probably not fully developed. The spiracles large and conspicuous, the margins imperfect and appearing as a circle of black hooks curving inwards towards the centre. The body surface covered with skin-points or granulations,

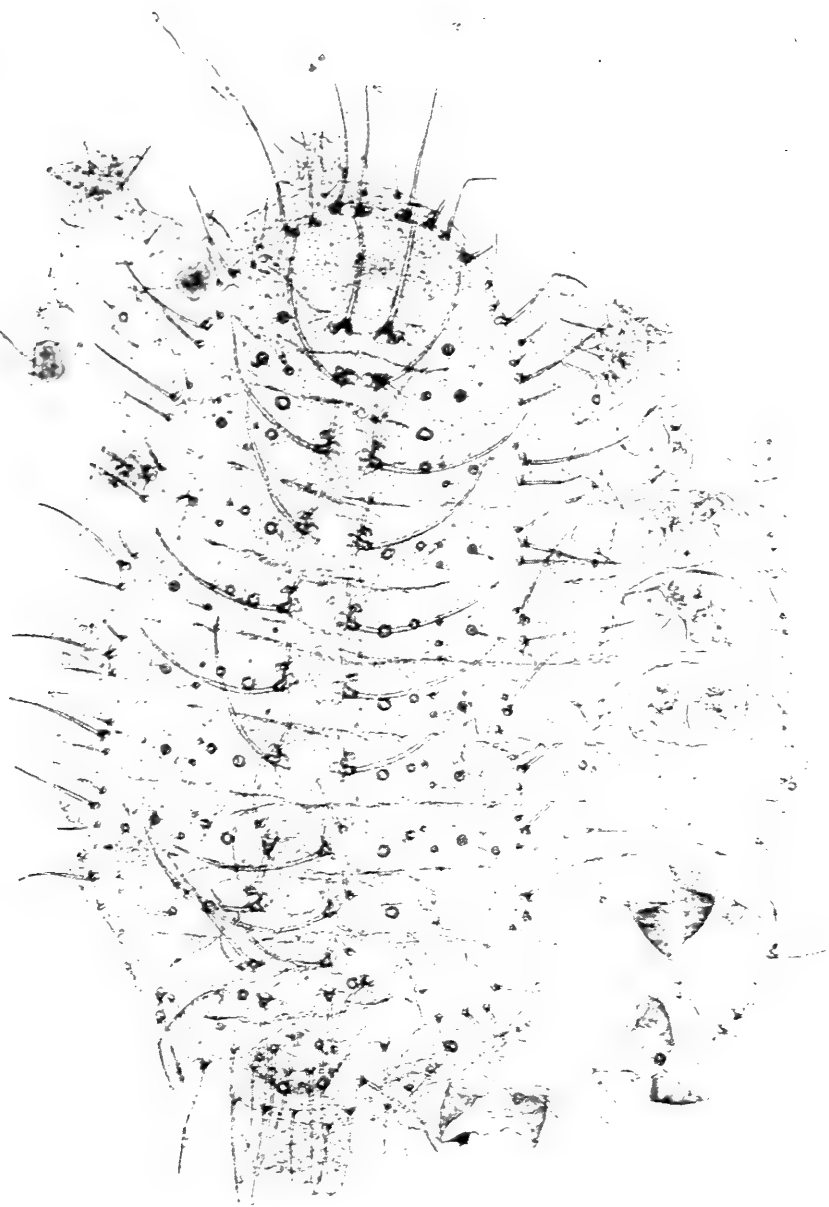


Photo. F. N. Clark.

SKIN OF LARVA OF AGRIADES CORIDON (FIRST INSTAR)  $\times 50$ .

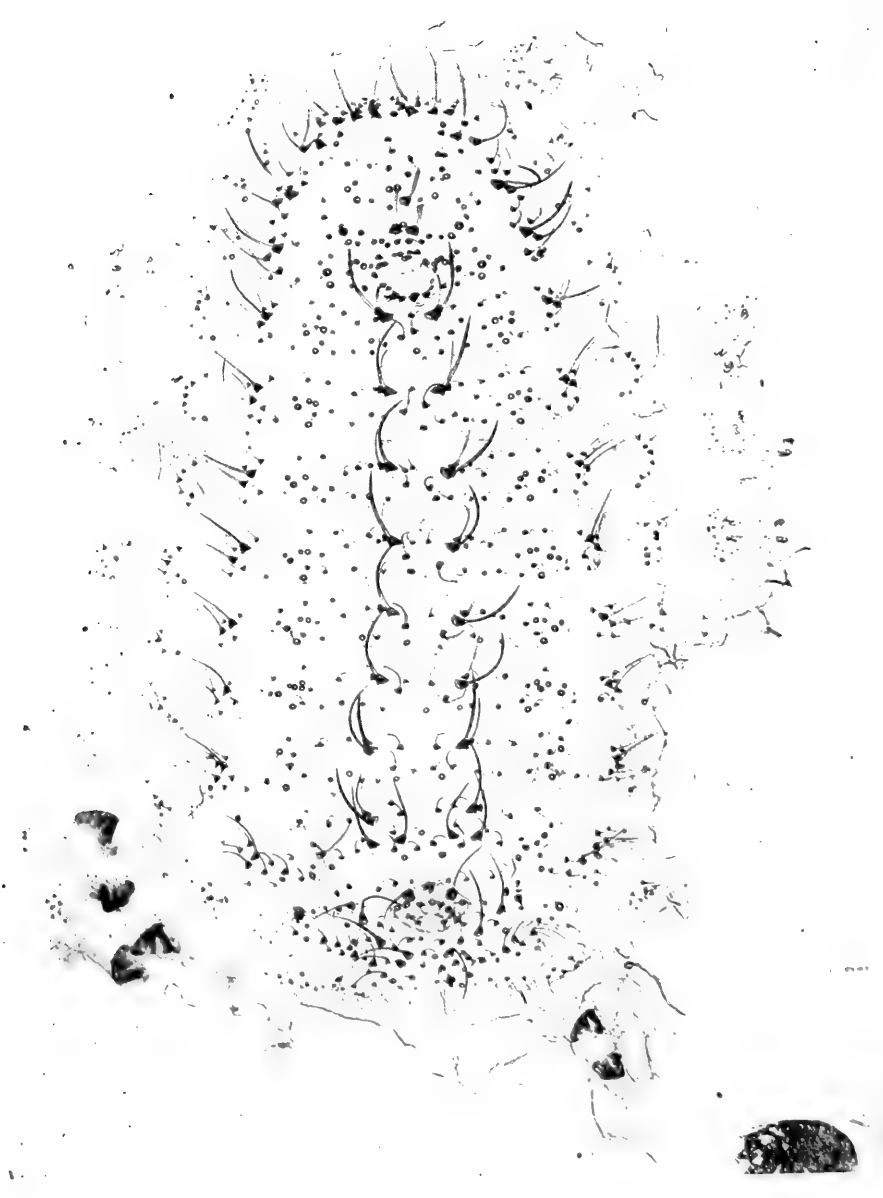
(Compare with Vol. III., plate xlv., especially hairs about tubercle iii.)

*A Natural History of the British Butterflies, etc., 1910.*

[To face p. 68.]







Photo, F. N. Clark.

SKIN OF THE LARVA OF *AGRIADES* CORDON IN SECOND INSTAR  $\times 30$ .

*A Natural History of the British Butterflies, etc., 1910.*

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colourless or faintly ochreous tint, but, when fullgrown in the first instar, it has a reddish-brown dorsal line, a reddish-brown patch just outside the middle of dorsal ridge (of each segment) extending to the first lenticle, a reddish band through the second lenticle, this one is the darkest, and another round and below the spiracle; these dark portions, however, extend upwards at the front of each segment, downwards at the posterior margin, especially the first one reaches down behind the first lenticles, and so the pale areas, which are of the original ground colour, are now rather the markings, and show already some indications, of the oblique lines. The dorsal flat is rather broad and smooth, the ridges bounding it rounded, the slopes also are fairly flat, and very nearly three times as wide as the dorsal flat; the slopes are less steep than in the larva of *Polyommatus icarus*, consequently the width at the marginal flange is greater in proportion to the width of the dorsal flat than in that species. *Second instar*: Length  $2\frac{1}{2}$  mm. In the second instar the hairs, etc., are much more numerous, *e.g.*, on the dorsum there are the setæ of tubercles i and ii, and two in front of i, one below and outside ii, and, in addition, one inside and behind ii that has a curious arrangement; on the 6th abdominal there is a pair (one on each side) of such hairs; on the 2nd abdominal, that of the right side only; on the 3rd abdominal that on the left; whilst on the 4th, 5th, and 6th abdominals, there is only one hair, and it is nearly central, so that it is impossible to say to which side it belongs; apart from the segments in front, one would describe it on these segments as a central azygos hair. As to colouring, there are pale, almost yellow, bands down the dorsal and lateral flanges; between these the reddish-brown is more extensive than at the end of the previous instar; the light (not yellow, but faint ochreous) colour forms round a patch of spicules which extends upwards, this upper portion almost forming a continuous line; above this is a dark band, and between it and the upper dark band bounding the yellow dorsal line, is a pale portion, hardly a continuous band. The segment is divided into two sub-segments, but only partially by a vertical depression down the "slope." On June 4th, 1906, now half-fed in the second instar, the larva is 3.3 mm. long, thick, and about 0.64 mm. wide for the whole length, except the rounded ends. Head black, the markings outlined at end of the first stage, are now plainer; a pale yellowish band along ridges, lateral ridge faintly paler than ground, above this dark, until a pale line midway up slope is reached, then a dark line, then another pale one, and above this a patchy dark line under the flanges. The ground colour is of a pale ochreous, which becomes dark green where the intestinal

blackish on the dorsal area, but paler on the ventral; these give the surface an appearance of roughness. Primary tubercles conspicuous, black, and each emitting a stout, white, spiculate seta, those on the trapezoidal tubercles being strongly curved, while those on the sides of the body are almost straight. The dorsal area bears a number of large and conspicuous lenticles, the metathoracic and first seven abdominal segments having each one on or near the subdorsal line. A smaller lenticle is also carried by the same segments about midway between the large lenticle and the lateral ridge, but these are not all in the same relative position, that on the metathoracic and 1st, 2nd, 3rd, 4th, 5th, and 7th abdominal segments being situate further back on the segment than the large lenticle, while on segment 6 the small lenticle is just above the spiracle and in the same lateral line, the large lenticle occupying a position near the posterior margin of the segment (A. L. Rayward).

contents are present. *Third instar* (well grown in this instar): It is now a very short, thick larva, angles sharp (in cross section), and dorsal plain and "slopes" nearly flat. Length 5.0mm., height 2.2mm., width 2.2mm. Colour a deep grey-green with black spiracles and hair-points, and bright yellow dorsal (ridge) and lateral lines. The hairs are all on tall bases, and are spiculated, but vary immensely in size, curve, direction, etc.; some few are short, finely-spiculated clubs, others long hairs, and there are all intermediates; all the hair-bases present some trace of spicules (wheel-points), and, in a few, they are fairly developed; lenticles are conspicuous near the spiracles, and on the prothoracic plate some occur near the dorsal ridges, but they vary in position on different segments, and on opposite sides of the same segments. On the 7th abdominal segment and those behind, the hairs are very small transparent clubs, generally curved backwards and slightly rough with spicules; the clubs of some of these are so small that they graduate into others, in which they are absent, and these are not easily, if at all, distinguishable from lenticles. The 7th abdominal segment has a transverse honey-gland slit; on the 8th abdominal also, outside and behind each spiracle, is a pucker of the ever-sible gland opening. *Fourth instar*: Notwithstanding its dull leaden ground colour, this is a brilliant little larva, owing to the rich orange-yellow dorsal and lateral lines and the black spiracles; the dorsal lines are present on the mesothorax, metathorax, and 1st to 6th abdominal segments; the lateral lines all round, but a little wanting on the extreme front. Dorsally, each line has the aspect rather of a patch on each segment than a continuous line, and there is a little of the same suggestion in the lateral line. The little raised tubes of the black spiracles are very conspicuous, and there is a faint pale shade half-way up the slope on the middle of each segment. The hairs are light rufous with dark bases. The slopes have a subsegmental median depression with branches, and the varied angle of the surface gives an effect of different depth of colour beyond the actual fact. The dorsal ridges (and yellow lines) are about 1mm. apart on the mesothorax, and gradually approach to 0.5mm. on the 6th abdominal segment. *Fifth instar* (June 26th, 1906): The larvæ have almost exactly the same appearance as in the fourth instar. The black raised spiracles are larger and, therefore, more conspicuous, as is the dark mark at the outer angle of the prothoracic plate; the subsegmentation of the mesothorax is more conspicuous dorsally, making the yellow line almost divided into two. The glands on the 8th abdominal segment are very conspicuous, rather flesh-coloured, a small area being without skin-points even when the gland is retracted; that on the 7th abdominal is a transverse line (of some width centrally) without skin-points, surrounded at a little distance by an oval line (without hairs, etc.), especially visible at the two ends. The hairs are bright, dark golden on both flanges and on lower line at base of legs, which, in some specimens, also shows a yellow longitudinal band. The prothorax has long hairs all over, and there are some on the mesothorax in front, but, elsewhere, the lateral slope of the terminal (7th-10th abdominal segments) slope has only minute black hairs little more than points. The long hairs are about 0.3mm. long (Chapman). *Full-fed larva*: Length 8 lines; the larva can, however, contract itself very much, so as to appear higher and more humped. Of the usual *Lycænid* form.



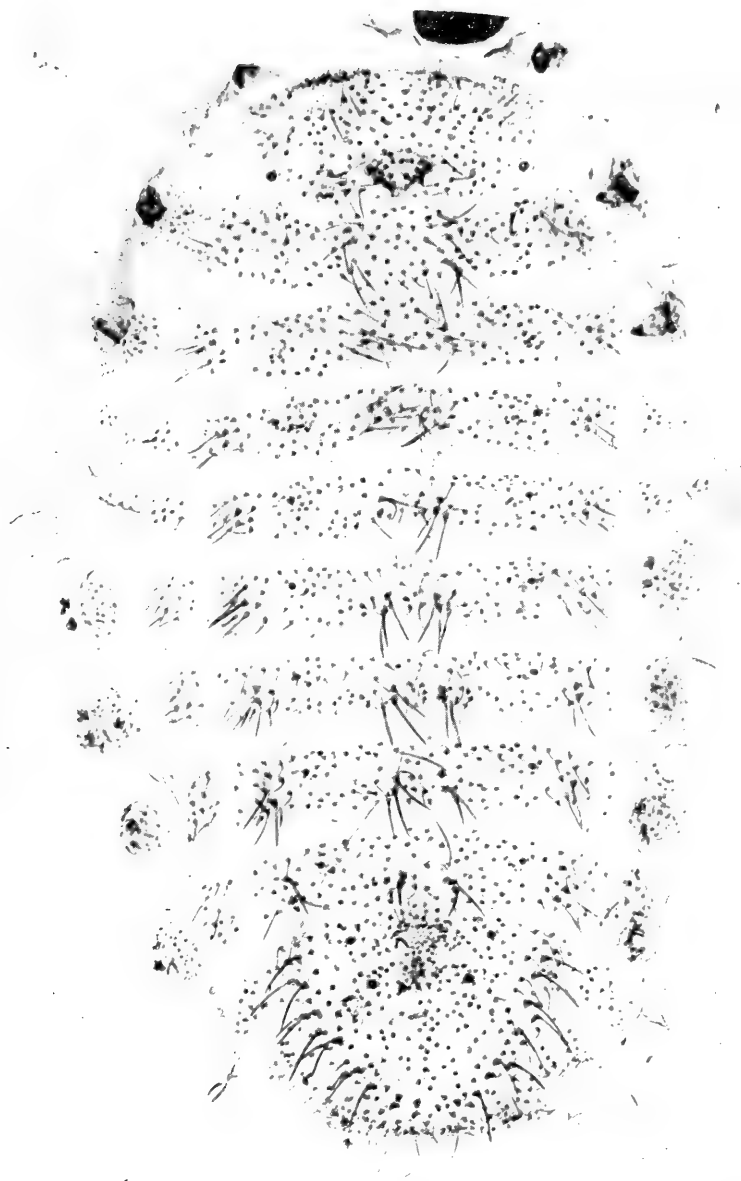
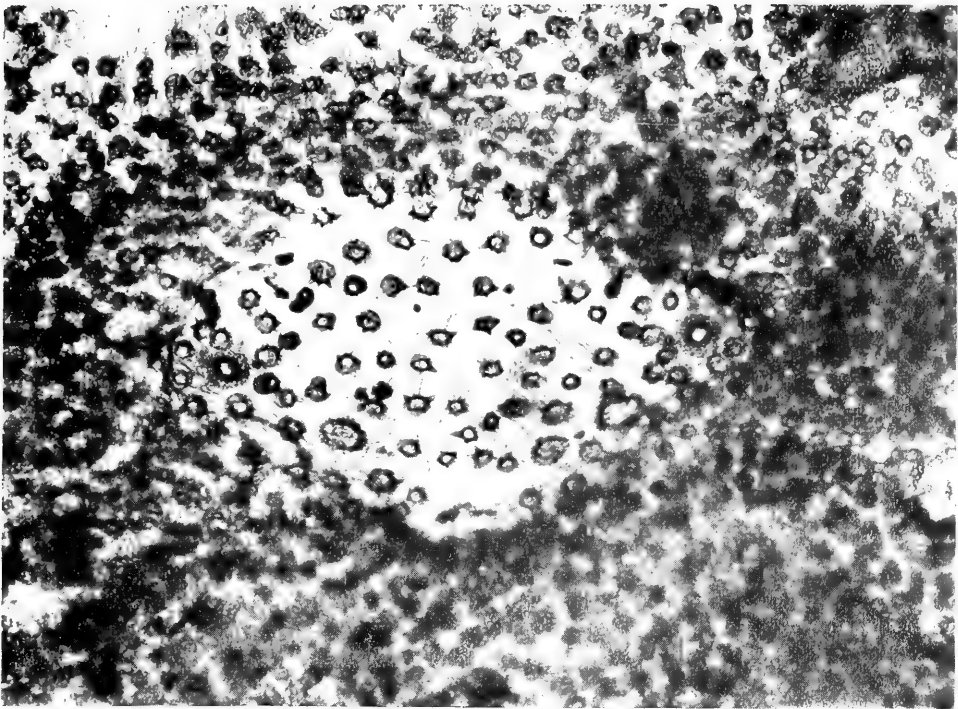


Photo. F. N. Clark.

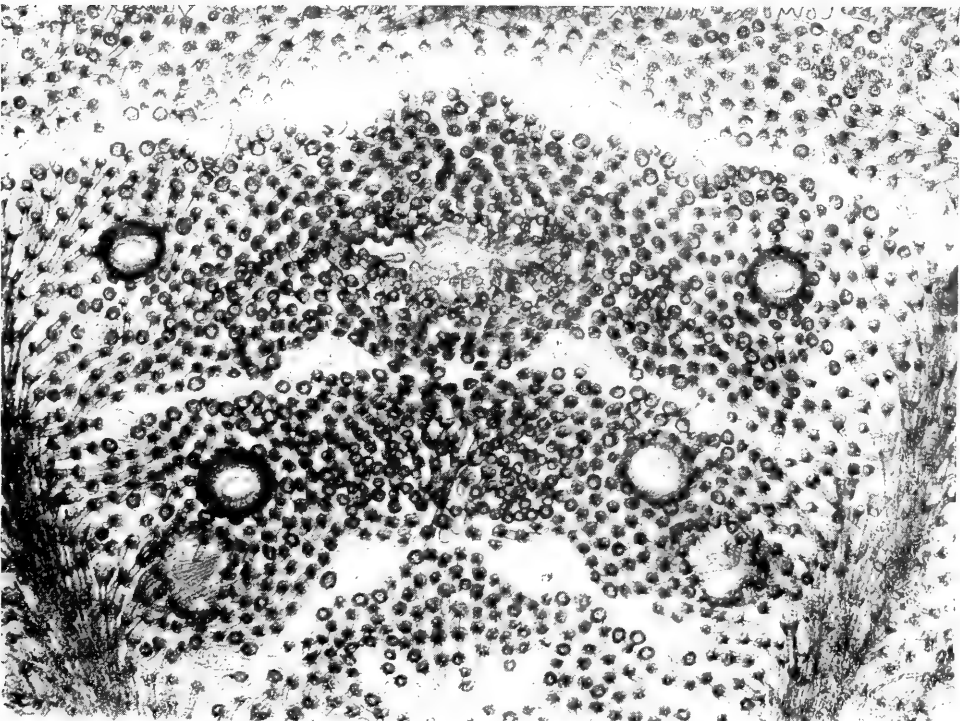
SKIN OF THE LARVA OF AGRIADES CORIDON IN THIRD INSTAR  $\times 18$ .  
*A Natural History of the British Butterflies, etc., 1910.*

[To face p. 70.]





1. PROTHORACIC PLATE OF LARVA OF AGRIADES CORIDON IN LAST INSTAR SHOWING BASIS OF SPECIAL PROTHORACIC HAIRS AT EACH ANGLE AND GROUP OF MODIFIED HAIRS ROUND THEM, FORMING AN APPARENT BLACK SPOT IN THE LIVING LARVA  $\times 70$ .



*Photo. F. N. Clark.*

2. ABDOMINAL SEGMENTS 7 AND 8 OF LARVA OF AGRIADES CORIDON AT LAST MOULT, SHOWING SPIRACLES, HONEY-GLAND OF THE 7TH, AND SPIRACLES AND EVERSI-  
BLE CARUNCLES ("FANS") OF THE 8TH, ABDOMINAL SEGMENT  $\times 40$ .



The back is very highly arched from the 2nd to the 9th segment, and from there slopes away in every direction. In the middle of the back is an exceedingly shallow depression in which the dorsal vessel pulsates; it would scarcely deserve to be mentioned if it did not produce an illusion as to whether there may be a strong lengthwise depression here. Each of the eight above-mentioned segments has a depression in the middle which extends as far as the spiracles, which lie high up on the side but in the depression, and are very clear and striking in consequence of the black border which surrounds the opening. Below the spiracles a very broad flange edges the body lengthways, beneath which another, not visible from above, has its place above the legs. The head is placed in a bordering of skin, out of which it scarcely ever comes. The ground colour of the body is a pleasing light blue-green, lighter on the underside, especially below the flange, and in the region of the claspers lighter still. The eight segments mentioned have each, on both sides of the dorsal vessel, a pleasing yellow spot, by which two rows of yellow dorsal spots are formed; of these the foremost are rounder and smaller, the rest larger, broader behind, and yellower. The whole lateral flange has the same yellow colour; above the claspers, not visible from above, is yet another row of very obsolescent yellow spots. The whole body is furnished with fine warts, of which those on the yellow spots have a yellowish-brown, the rest a black, colour; all bear light foxy-red bristles, the former somewhat longer ones, whilst the warts which are situated on the green ground colour bear extremely short, scarcely perceptible, bristles; the longest are those on the lateral flange and on the row of spots above the true legs. From this results the following diagnosis—Larva onisciform, bright green, with two series of dorsal triangles and the lateral edge of the body yellow; the head, and very conspicuous spiracles, black. Before pupation the larva becomes lighter, even with regard to the yellow spots (Zeller). The head is almost globular, but rather produced towards the mouth; it is about one-third as wide as the prothorax and entirely retractile within that segment; the body is woodlouse-shaped, and, in crawling, as in resting, both the head and legs are concealed; the divisions of the segments are decidedly marked; on the back is a double dorsal row of eight approximate humps, two on each segment from the mesothorax to the 6th abdominal (both inclusive); the margin of the body is dilated all round, and this greatly contributes to the woodlouse appearance of the larva; the surface of the larva in this respect closely resembles the glandular surface of the stems and leaves of some plants; these gland-like bristles are particularly observable on the dilated lateral margin; the legs and claspers form a double medio-ventral series. The colour of the head is dark brown, almost black, and highly glabrous; the body is dull opaque-green, with six longitudinal series of oblong gamboge-yellow spots; two of these series are dorsal and approximate, and each series consists of eight such spots; the direction of the spots is rather oblique, and the anterior extremity of each is rather narrowed; these dorsal spots occupy the summits of the humps already described; another series of very similar yellow spots is marginal, occupying the lateral dilatation of each segment, and above this marginal series of yellow spots are the circular and rather conspicuous spiracles; in the two remaining series the yellow markings are linear and

ventral and equidistant between the claspers and dilated margin (Newman).

COMPARISON OF LARVÆ OF AGRIADES THETIS AND A. CORIDON.—In the first stage, I find no difference that is appreciable between the larvæ of the two species except in the minute hairs between the subdorsal lenticles and the spiracles. In *A. thetis* these are very minute, and I think often replaced by minute lenticles, and occasionally one or other is absent, as in the example figured (*antea*, vol. x., pl. xlv., p. 363), in which only one is present on the 2nd and 3rd abdominal segments. In *A. coridon* the hairs are practically always visible, are curved and club-shaped, and twice as long as in *A. thetis*, when they are present in that species. Taken altogether, the lenticles and hair-bases appear to be larger and bolder in *coridon* than in *thetis*, and even the prothoracic plate larger. Against this I must, however, note that much of my observation of *A. coridon* was on examples from Riviera eggs which are larger than the British ones (racially or seasonally ?), and so the larvæ may have been correspondingly larger and more robust. In the following instars I am unable to say anything decidedly as to any structural differences between the two larvæ. In the last instar the small hairs on the slopes seem rather longer and less curved than in *A. coridon*, the width of the prothoracic plate is also greater in *coridon*, viz., about 1·00mm. against 0·85mm. in *thetis*, and the hairs are decidedly shorter and smaller in *A. thetis* (Chapman). The larvæ of these two species resemble each other in every detail of form and ornamentation, except the following two points: The larva of *A. thetis* has (1) the ground colour deeper green, with (2) the hairs or bristles black, whilst that of *A. coridon* has (1) the ground colour of a lighter brighter green (a green with more yellow in its composition), and (2) the hairs light brown (Hellins). Zeller states (*Stett. Ent. Ztg.*, 1852, p. 425) that “Boisduval’s larva of *adonis* (*Icon. Chen.*, pl. ii., figs. 4-5) has the spiracles black, very conspicuous, with broad border, forming a series of spots in line, whilst his larva of *coridon* (*op. cit.*, figs. 1-2) has them ‘black, very small, scarcely visible to the naked eye,’ whereas Zeller’s own larvæ of *coridon* appeared to be exactly like those of Boisduval’s *adonis*.” [See also *antea*, vol. x., p. 369.]

PUPATION.—The fullfed larva appears to travel some distance in order to find a suitable place for pupation. On August 13th, 1909, just above Franzenshöhe, on the Stelvio, a full-fed larva was found crawling in the dust on the roadway, and was put into a box, in which it had changed to a pupa by August 26th, without further feeding. Lowe mentions (*Ent. Record*, xvii., p. 80) the capture of other larvæ, also on the Stelvio, under almost exactly identical conditions; he observes that “the dust was thick in the road, and the larvæ left deep tracks, and were themselves coated with dust; they were removed to the larva-cage and duly pupated.” On June 9th-10th, 1909, a fullfed larva (from Reigate) in confinement got very restless, and travelled about a good deal and then disappeared; on the morning of the 14th, it was discovered in a hollow on the surface of the ground at the roots of the foodplant, quite hidden from sight, and only detected when the root was pulled aside, its bright green colour and yellow spots (which appear to get paler when the larva is quite fullfed) quickly leading to its detection. It appeared to have spun a loose silken thread or two, to hold a few stalks of the *Hippocrepis* and a few dried grass stalks together, but if so, they were so weak that they broke as soon as the

plant was bent back. The larva was then seen in the cavity resting on the main stem of the root, and appeared somewhat shrunken in length but wider than before. This disturbance caused it to show itself again on the 15th when it was quite 2ft. from the foodplant and its colours still bright, but on the 16th it had again disappeared, and on the 18th it was found in another little hollow among the stems just below the surface of the ground, much lessened in length, but increased in width, and of a paler colour than when last seen; on the 21st the pupa was observed (evidently just changed), its nose pointing slightly upwards, the pupa lying at a slight angle, so that the posterior portion was lower than the anterior, the front part of the pupa slightly greener than the hinder, although it was rather bone-colour in general appearance. The puparium, as already noted, seemed to be merely a little oval space hollowed out by the movement of the larva round and round until just large enough for it to settle comfortably in, a little piece of loose leaf and stick only separating its head from the surface of the ground. The pupa is without any proper cremastral hooks, but the larval skin is usually retained on the anal segment; it easily shakes loose, however, and there is no attempt at attachment either directly or by means of the larval skin. Hellins describes the larva as going underground to pupate; Rühl says that the larva buries itself and makes no girth, apparently a mere repetition of Zeller's observation (*Stett. Ent. Ztg.*, 1852, p. 427) that the larva goes on the ground, or perhaps even into it, without spinning any thread round the body. Rayward observes that, in confinement, the larva leaves the foodplant and buries itself amongst the roots just below the surface of the ground, and there seems little doubt that this is the usual position under natural conditions; no sign of silk-spinning has ever been noticed by larvæ under observation, when retiring for the purpose of making their puparia. Newman states that some larvæ that he had were fullfed about June 13th, 1870, and these pupated without attaching themselves in the slightest manner to the foodplant or anything else. Zeller states that pupation follows in about three days from the time that the larva enters the ground, and that the pupal period lasts about three weeks. Newman reports (*Ent.*, v., p. 139) the pupal stage as lasting from about June 13th to July 6th-9th, 1870. Rayward says (*Proc. Sth. Lond. Ent. Soc.*, 1907, p. 66) that the pupæ of *A. coridon* appear to be attended by ants if exposed. Krodol notes (*Allg. Zeits. für Ent.*, ix., pp. 105-106) that the larvæ pupate exclusively on the ground, under stones or in rolled leaves, quite free and without girdle; in some cases a considerable number of these larvæ had pupated under a half-raised stone, and had loosely fastened together the underlying sand with some spun threads; in nature, they pupate under the stones which they have used as larvæ for hiding-places, and, in order to find the pupæ, one has only to turn over the stones in their habitat as in searching for larvæ.

FOODPLANTS.—*Hippocrepis comosa* (Boisduval, Hellins, Schmid, etc.); *Coronilla varia* (Zeller, Herrich-Schäffer, Wocke, Koch, etc.); *C. minima* (Herrich-Schäffer, Koch); *Astragalus glycyphyllus* (Speyer, Höfner, etc.); *Lotus corniculatus* (Boisduval, Guenée, Newman, Goossens, etc.); *Hedysarum onobrychis* (Boisduval, Guenée, Frionnet); *Onobrychis* (Bartel and Herz); *Vicia* (Treitschke, Möschler, Höfner, etc.); *Anthyllis vulneraria* (Newman); *Pisum sativum*, fruits (Kranz);



*Trifolium* (Boisduval, Guenée, Newman); clover (Doleschall, Frionnet, Goossens); *Plantago* (Martorell). Of all these reputed foodplants, one suspects that only three are based on actual knowledge, viz., *Hippocrepis comosa* (Boisduval, Buckler), *Coronilla varia* (Zeller), *Astragalus glycyphyllos* (Speyer), and perhaps a fourth, *Coronilla minima* (Koch). As for the rest of the plants, one suspects that the records have been based on various errors botanical and otherwise. Gedge notes (*Ent. Mo. Mag.*, iii., p. 70) that the larva eats *Hippocrepis comosa*, but refuses *Lotus corniculatus*. Doubleday also observes (*op. cit.*, p. 91) that larvæ that he had refused *Lotus corniculatus*. Zeller notes (*Ent. Mo. Mag.*, vi., p. 11) that the foodplant is certainly *Coronilla varia* at Glogau, Frankfort-on-Oder, and Meseritz, where there is neither chalk nor *Hippocrepis*, but, in the higher parts of Carinthia, where *Hippocrepis* grows in the greatest profusion in all the meadows where the butterfly occurs, there is no *Coronilla* (except *C. emerus*). Zeller also throws doubt (*Stett. Ent. Ztg.*, 1852, p. 425) on the reputed foodplants enumerated by Boisduval—*Trifolium*, *Lotus*, *Hedysarum onobrychis*, as well as *Hippocrepis comosa*, on which, however, he afterwards found larvæ. Krodell states (*Allg. Zeits. für Ent.*, ix., p. 104) that larvæ sent to him by Jüngling from Regensburg, and found on *Hippocrepis comosa*, refused other allied plants belonging to the family of the *Papilionaceae*, viz., *Lotus corniculatus*, *Onobrychis sativa*, *Trifolium pratense*, *T. repens*, *Medicago sativa*, *M. falcata*, *Melilotus officinalis*, *Coronilla varia*, which he offered them in the hope that they would find among them a foodplant to their taste. He adds that his expectation was, however, delusive, they would die sooner than touch any one of the plants. Even *Coronilla varia*, which is quoted in all works on lepidoptera as a foodplant, and on which Zeller reared his *A. coridon* larvæ exclusively, was refused. He says that he had no course left but to continue feeding them on *H. comosa*, unless he were willing to give up rearing them altogether. Gillmer, on the other hand, states (*in litt.*) that at Krüchern, in the Cöthen district of Anhalt, the larva feeds only on *Coronilla varia*; *Hippocrepis comosa*, he says, does not occur in Anhalt.

PARASITES.—*Blepharidea vulgaris*, Fln., *Exorista confinis*, Fall., bred 1909, and identified by Mr. C. J. Wainwright (H. Wood, *in litt.*). [See also preceding vol., p. 370.]

PUPA.—Pale ochreous in tint, with faint blackish shading over the abdominal segments. Length 11·7mm., width (across 4th abdominal segment) 4mm. Ventrally, the portion beyond end of wings is 2·5mm., and looks very short (or the wings long). [Comparison is made with pupæ of *A. thetis* (*bellargus*), chiefly because living specimens of these are available.] A pupa of *A. thetis* (*bellargus*) 10·5mm. long, has this portion all but 3mm. long. The wings have rather a solid appearance, but the eyes show no change; a pupa of *A. thetis* (*bellargus*) with similar wings, has eyes black, and antennæ, etc., dark. The greatest width is 4mm., and it is 3·7mm. at wing spines, so that the pupa tapers very little forwards, less than *A. thetis* (*bellargus*). The portion of the antennæ beyond where they cover the maxillæ, seems shorter than in *A. thetis* (*bellargus*), a shade under 2·5mm., against 2·5mm. in the smaller *A. thetis* (*bellargus*). The number, size, and distribution of the hairs, agree closely with those in *A. thetis* (*bellargus*), and the black portion of the hairs is much the same; there seems to be considerable variation in



EXPLANATION OF PLATE VIII.

(*To be bound facing Plate VIII.*)

STRUCTURAL DETAILS OF HEAD OF PUPA OF AGRIADES CORIDON.

- Fig. 1 (lower figure).—Interantennal portion of head. Base of an antenna shown. Dorsal headpiece showing as coloured patch on right side, less marked on left. Antenno-basal hairs on left side, bases only on right (hairs broken off); the rest of the interantennal region without sculpture, etc., except the skin net-work; behind this sundry other hairs  $\times 45$ .
- Fig. 2 (upper figure).—Face portion of head, following on to part shown in Fig. 1. To the left is the arc of "glazed eye," with its numerous facets and the ordinary skin surface with hairs within it. To the right (centre of preparation) of the figure are the labrum and two mandibles pushed apart in flattening preparation. Note the different texture of the labrum and mandibles, compared with that of the ordinary surface (with hairs, etc.) of the rest of the face  $\times 45$ .

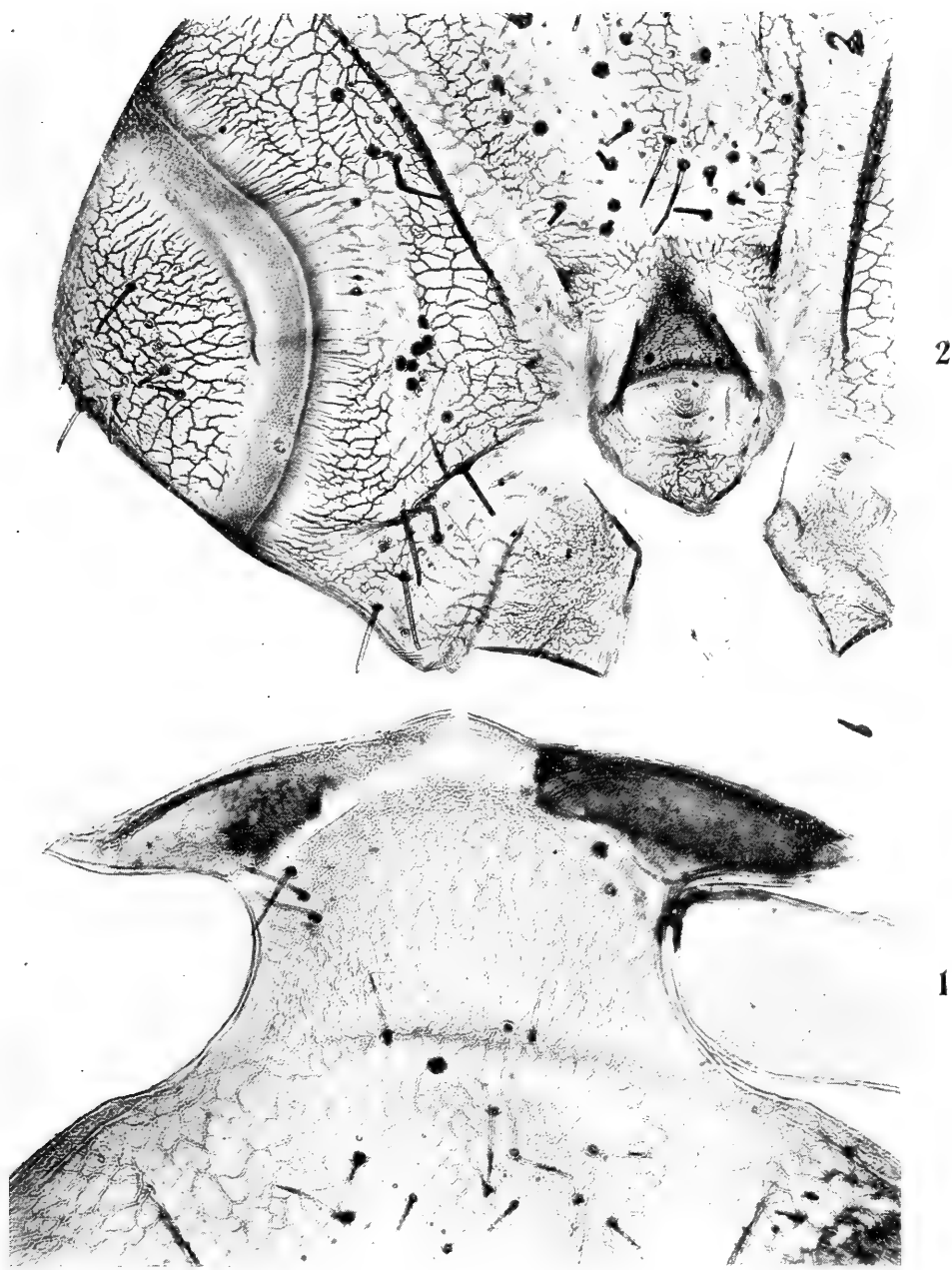


Photo. F. N. Clark.

STRUCTURAL DETAILS OF PUPA OF AGRIADES CORIDON. TWO PORTIONS OF HEAD  $\times 45$ .

FIG. 1 (lower).—INTERANTENNAL PORTION OF HEAD; DORSAL HEADPIECE AND BASE OF AN ANTENNA SHOWN.

FIG. 2 (upper) —FACE PORTION OF HEAD (FOLLOWING ON PIECE SHOWN IN FIG. 1); THE GLAZED EYE SHOWING TO LEFT; THE LABRUM AND TWO MANDIBLES JUST TO RIGHT OF CENTRE.



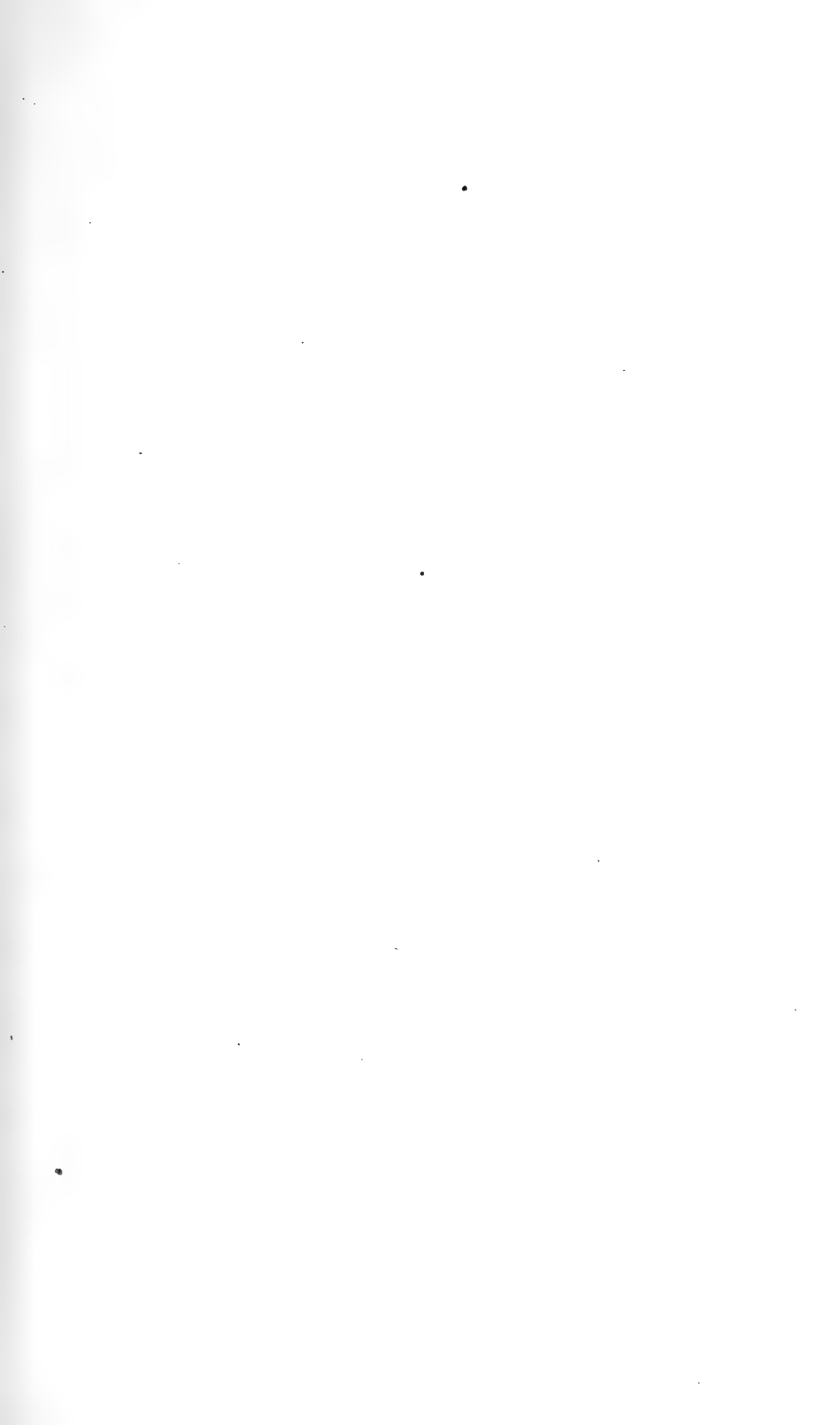
both *A. coridon* and *A. thetis*, as to whether the black ring is central or terminal (*never* basal?). The cremastral area is similarly without hooks, but has the same armament of hairs (the same as elsewhere but rather longer). The abundance and darkness of the hairs in the spiracular region is more marked than in *A. thetis*, in which they seem to be appreciably fewer and paler. The swarm of lenticles is also rather stronger in *A. coridon*. [Described September 7th, 1909, from pupa obtained from larva found on the Stelvio above Franzenshöhe, August 13th.] On September 10th the eyes were darkening and wings thickening, still ochreous, but of a brighter, more yellow, tint. The imago emerged September 19th, 1909 (Chapman). The pupa is rounded and entirely without projecting points or angles; the extremities are remarkably obtuse; it is covered with short hairs, which, however, are not very apparent without the use of a lens; its colour is a pale, dingy, greenish-brown, and the cases which envelop the thoracic segments and wings have a semitransparent appearance (Newman). The pupa is  $5\frac{1}{2}$ -6 lines long, somewhat broad, quite hairless, dirty brownish-yellow, with conspicuous darker dorsal line and somewhat whiter dorsal shield, and similar wing-cases and leg-cases; the latter are somewhat conspicuous. The eyes are not at all prominent, and have, along the whole of their front edge, a shining, polished, rather broad line, which seems to be a peculiarity of many Lycænid pupæ, modified according to the species. The diagnosis for the pupa of *A. coridon* would thus be: Pupa glabrous, brownish-yellow, with a darker dorsal line on the abdomen; thorax and wings pale; anterior margin of eyes polished. According to Boisduval the pupa is yellowish or greenish-yellow, with very conspicuous eyes producing a small, brighter projection—none of which description corresponds with my pupa (Zeller).

COMPARISON OF PUPE OF AGRIADES THETIS AND *A. CORIDON*.—The differences between the pupæ of *A. thetis* and *A. coridon* are very slight; to the naked eye it is doubtful whether there are any; both are green when they first assume the pupal state, both a rather dull ochreous when fully mature, and just before the indications of the developing imago within first appears. My own impression, liable to be mistaken owing to never having pupæ of the two species of the same age side by side, is that that of *A. thetis* preserves the green colour more persistently; that whilst, for instance, the wings of *A. coridon* soon become pale ochreous, those of *A. thetis* retain a fairly green tint, if not so clear and bright as at first, until the time when the opacity of the developing wings within occurs and dominates the tint. As to size, relative proportions, etc., both species show a range much beyond the difference, if any, between them. When we come to minute structural details, we find a remarkable identity of characters. For instance, the hairs generally are of ordinary form, straight and pointed, but, in both species, those around the 6th abdominal spiracle are clubbed, or rather are shortened with a knob at the end; in a few specimens this tendency slightly affects the 7th abdominal segment, and in one or two cases is not very pronounced in the 6th. I have not met with this peculiarity in pupæ of other Lycænids, but then those I have examined closely enough are very few, *e.g.*, have not detected it in *Polyommatus icarus*, the nearest species to these two. In both species a few of these clubbed hairs occur on the pro-

thorax. The most pronounced difference is in the greater number of hairs in *A. coridon*, their slightly greater length and their having more uniformly their terminal portions dark in colour, *e.g.*, round the spiracle of the 2nd abdominal segment there are 12 to 15 hairs in *A. thetis*, 40 to 50 in *A. coridon*, and extending to the margins of the segment instead of merely in the spiracular area. The other segments present similar differences. This character would readily serve to distinguish the two pupæ, were it not for the difficulty of counting the hairs in a living or mounted specimen. On the ventral aspect, the hairs on the 5th and 6th abdominal segments on what one may call the proleg region, are twice as numerous and half as long again in *A. coridon* as in *A. thetis*. In both species this area presents another point of interest. In the undisturbed pupa the ends of the antennæ abut against the margin of the 5th abdominal segment, no trace of the maxillæ appearing, but, when this portion of the pupa is more closely examined after making it transparent on a slide, it is seen that the maxillæ have here a small portion so far chitinised that one would expect to find them exposed externally, though this is not so, and that a further portion (about 0.6mm.) passes into the sheath (in intersegmental membrane) behind the 5th abdominal segment; the anterior margin of this segment is also folded inward and backward across the whole front of the segment. Further, the 6th abdominal segment has a large flap of similar form in both species, folded inwards and backwards from its front margin, either of the segment itself or of the intersegmental tissue (if these are distinguishable otherwise than functionally), and a very narrow strip is similarly folded in along the front of the 7th abdominal segment; this strip seems to be entirely in the intersegmental membrane. The lenticles are, perhaps, rather larger and more crowded in *A. coridon* in the spiracular region. In both we have the scar-like smooth area with the skin-ribs around it arranged in some degree in a radiating manner halfway between the dorsum and spiracles on the 3rd to 6th abdominal segments, and also, but less obviously, on the 1st and 2nd abdominals, quite wanting on the 7th, and corresponding with the "upholstered" hollows that exist at these points in the larva. The scar of the honey-gland is very similar in both pupæ, and is visible in the living pupa or the empty shell to the naked eye (Chapman).

TEMPERATURE EXPERIMENTS ON PUPÆ OF *AGRIADES CORIDON*.—Krodel records (*Allg. Zeits. für Ent.*, ix., p. 106) that he was only able to experiment with low (cold) temperatures. He found that the "critical moment," *i.e.*, that point when the chitinous skin of the pupa possesses the necessary consistency to be able to endure without danger rapid and extreme changes of temperature, and at the same time the pigments respond to these changes and lead to an alteration of the wing-markings, could be fixed at a pupal age of five to six hours; younger pupæ die in the cold through the crushing of their chitinous skin, and after they are six hours old, pupæ give no aberrations. One must not, he says, allow oneself to be deceived by the glassy appearance of the pupæ and assume that they are too fresh for the experiment, since the pupæ of both *Agriades coridon* and *Hirsutina damon* possess the same transparent exterior up to the age of two or three days, which allows nearly all the details of the enclosed future imago to be clearly perceived, just as it appears immediately after entering the pupal state. Krodel then



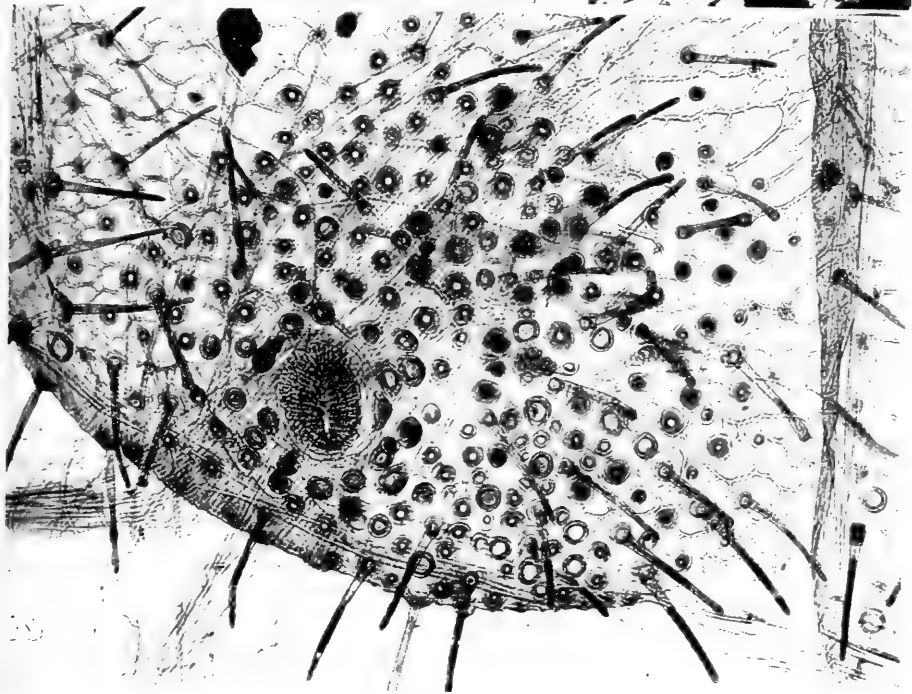


EXPLANATION OF PLATE IX.

(To be bound facing Plate IX.)

STRUCTURAL DETAILS OF PUPA OF AGRIADES CORIDON.

- Fig. 1 (right-hand side).—Ventral aspect of abdominal segments 5, 6, 7, and 8. The mid-venter is free from hairs, and the skin-sculpture is reduced to fine longitudinal wrinklins. [Abdominal segments 9 and 10 show no trace of cremastral hooks, either in the portion photographed or elsewhere]  $\times 40$ .
- Fig. 2 (left-hand side).—Spiracular region of the 2nd abdominal segment. This should be compared with the corresponding plate of *A. thetis* (preceding volume, pl. xlvii), much more magnified than this, but bringing out well the different size and character of the hairs, etc.  $\times 75$ .



—> Head.

2

SPIRACULAR REGION OF THE 2ND ABDOMINAL SEGMENT  $\times 75$ .  
(Compare with Vol. III., plate *advin.*)



—> Head.

1

VENTRAL ASPECT OF ABDOMINAL SEGMENTS 5, 6, 7 AND 8  $\times 40$ .  
Photo. F. N. Clark.

STRUCTURAL DETAILS OF PUPA OF AGRIADES CORIDON.

*A Natural History of the British Butterflies, etc., 1910.*

[To face p. 76.]



gives (*op. cit.*) a series of figures to illustrate the results. He says: "This species produced, through refrigeration, only forms which display a reduction, of the ocellation. It is especially the eye-spots of the hindwings which tend to disappear. In the ♂ in fig. 2, the eye-spots of the hindwing have nearly, in fig. 3, entirely, disappeared, also, in both, the basal spots of the forewing are wanting. Some transitional examples, which exhibit very clearly the gradual diminution of the ocelli, I have omitted to put into the illustration, in order not to exceed the limits of one plate. An insect analogously marked with the artificially produced fig. 3, was taken by Sigmund Hetz, of Würzburg, on July 1st, 1903, near Dissentis, in Switzerland, and is illustrated in fig. 4. The most extreme aberrant form of my experiment series, is, however, given in fig. 5. In this, not only are all the ocelli wanting, but also the black elements of the marginal markings, only the orange-yellow spots of the latter remain in an extremely elementary condition. The discoidal spot of the forewing is represented by a thin black line. The ground colour of the underside is clear white. The specimen, a ♂, corresponds with the *ab. cinnus*, which Hübner has represented by a ♀ specimen, and illustrated in his *Europ. Schmett.*, figs. 830-1. In this ♀ *cinnus* of Hübner's, the ground colour of the outer half of the forewing is also strikingly white, and of all the markings only the discoidal spot and the orange lunules of the outer margin remain."

**TIME OF APPEARANCE.**—The species is as distinctly single-brooded in Britain and Central Europe, as its ally *A. thetis* is double-brooded. Throughout Britain, Northern and Central France, Switzerland, North Italy, Germany, Austria, Hungary, Bulgaria, the Balkan peninsula, Roumania and Russia, the central tableland of Spain, etc., the species is single-brooded, rarely occurring until July, and most abundant from the third week in July until the second week in September, continuous emergences taking place in most seasons and most years over this period, with occasional earlier and later emergences in special seasons, and sometimes being continuously on the wing for from ten to twelve weeks. But over a certain part of South France, extending from Nîmes in dept. Gard through Vaucluse, Bouches-du-Rhône, the littoral of Var, and the Alpes-Maritimes, and entering Liguria, there appears to be at least a partial, if not very complete, second-brood, the first brood occurring in Gard in early May (Tutt), Vaucluse (H. Brown), Bouches-du-Rhône (Siépi), Var, April-May (Chapman, Tutt), Liguria, May 22nd (Blachier), June 1st-13th (Bartel), etc. At Ste. Maxime, Pardigon, etc., the April-May brood is very abundant, all eggs laid there hatching in a few days, and larvæ fullfed in July, suggesting a complete second-brood (*teste* Chapman), but, in the Bouches-du-Rhône, Siépi notes the May brood as a "very partial" one, and details are still wanting as to this brood in this district, whilst the early examples to Pont-du-Gard, etc., appear singly. In the Alpes-Maritimes (Cannes district), Millièrè states that it occurs in June and again in September. In the hotter parts of the Basses-Alpes, Digne, etc., the species occurs in June (first week appears to be the earliest record), whilst it is noted at Digne as late as October 16th, in 1902 (Rowland-Brown). Whether it is double-brooded in Liguria or not is quite open to doubt. At present the earliest date is May 22nd, 1903, at Chiavari (Blachier), but Bartel's dates June, 1st-13th, 1904, are no earlier than the

records from various parts of France and Spain, etc., where a second brood is not suspected. In Southern Spain, it may be double-brooded—it is at any rate recorded as early as April 23rd, 1905, at Granada (Muschamp), but in Catalonia, New Castile, Aragon, etc., there is no evidence whatever of a second-brood. In Italy, too, the actual evidence of double-broodedness is wanting. Stefanelli states that it occurs almost everywhere in Tuscany from the middle of May to September, without suggestion, however, of two broods, but Verity writes (*in litt.*) (without offering any proof by breeding or otherwise) that, in Tuscany, up to 500 mètres, the species is double-brooded, occurring in April-May and August-October, the specimens of the first brood having the markings of the underside more strongly developed, those of the second brood being a transition to the single-brooded mountain form that is lighter in colour and markings. Further details, however, based on actual breeding of specimens, is very desirable. In Transcaucasia the species is noted as occurring in July (Romanoff), and at Tokat and Amasia, in July (Fountaine); in Russia, in the Orenburg district, in June (Eversmann); in the Kasan Government, June and July, and in the Wiatka Government, in July (Kroulikowsky); in Bulgaria, July and August, very common (Bachmetjew); July-September, in Bosnia (Rebel); July and August, in Croatia (Grund); mid-July to beginning of September, in Hungary, (Aigner-Abafi); end of June to mid-August, in Galicia (Nowicki); late June (singly) to end of August, in Carniola (Hafner); late June to August, but single-brooded, in Carinthia (Zeller); mid-July to October, in Moravia (Fritsch); in August, in Morea (Rebel); in June, in Bosnia and Montenegro (Nicholl). In Spain, it has been (as already noted) recorded as early as April 23rd, 1905, at Granada (Muschamp); May 9th-13th, 1901, at Caldas de Maravilla, and May 21st, 1901, on the southern slopes of the Sierra Nevada (Nicholl); June 10th, 1904, at Jaca (Burr); June 10th, 1905, at Barcelona, June 16th, 1905, at Montserrat (and out the same year on June 17th, at Vernet-les-Bains) (Standen); whilst Burr observed it on July 13th, 1905, at Montserrat, and on June 23rd-24th, it was taken at Montsény (Nicholl), etc. Chapman has collected over a large area in Aragon, New Castile, etc., and has found the species in July and August, although sometimes, in mid-July, it has not been fully out. This is written only to show how little we know whether there are two broods or not in Spain, even locally, and our knowledge of its appearance in Southern France and Italy, is even more fragmentary. We offer the following list of recorded dates for Continental and British localities, leaving the question of the double-brooded area of this species and its hybernating habit in such areas to be worked out later by someone with more detailed and abundant data, only surmising that the areas in which a double-brood can possibly occur, must be of necessity very limited. The dates we have collected for CONTINENTAL LOCALITIES are:—July 12th-21st, 1867, at Raibl (Zeller); June 28th-July 3rd, 1872, at Lucca (Walker); August 18th, 1872, at Meiringen (Lang); July 24th-31st, 1875, at Argèles (Distant); end of August, 1876, in the Kanderthal, at Chur, Menaggio, and Val Vedro (Forbes); July 7th, 1878, between Chiavenna and Casaccia (Elwes); July 30th and August 1st, 1882, at Leuk, 5000ft. (Elwes); September 1st, 1882, at Pierrefitte Nestalas, at 1665ft. above sea-level (A. H. Jones); July, 1884, at Alveneu Bad and Pontresina (Lemann);

July 5th, 1885, at Pontresina (Elwes); July 24th-27th, 1885, at Saas-im-Grund (Jones); July, 1886, at Le Prese (Buchanan-White); June 29th-July 11th, 1887, at Vernet, July 12th-19th, 1887, at Bagnères de Luchon, July 20th, 1887, at St. Sauveur, July 23rd, 1887, at Luz (Elwes); May 8th, 1888, at Beaulieu,\* May 14th, 1888, at St. Martin Lantosque\* (A. H. Jones); July 22nd-August 14th, 1888, on the Taunus Hills, rare (Prideaux); August, 1888, at Rochefort (Carlier); first seen May 19th, 1889, at Hyères\* (Norris); June 5th, 1890, at Digne\* (A. H. Jones); June 26th-July 6th, 1890, at Engelberg (Bethune-Baker); July 19th-23rd, 1890, at Tancarville (Leech); July, 1891, at Digne (Lemann); June, 1892, at Budapest (Lemann); swarming in July and August, 1892, at the Certosa di Pesio, some ♂s very white above (Norris); end of July, 1892, at Bundorf (Leech); July 27th, 1892, at Campiglio, July 30th, 1892, at Riva (Elwes); May 14th, 1893, at Venice\* (Bromilow); June 8th-21st, 1893, in the Budapest district (Nicholson); July 28th-August 2nd, 1893, near Paris (Tutt); May 1st-7th, 1894, at Digne\* (Jones); July 30th, 1894, at Bourg St. Maurice, August 1st-7th 1894, at Courmayeur, August 9th-16th, at Cogne, August 18th-19th, at Aosta, August 21st, 1894, at Grésy-sur-Aix (Tutt); July, 1894, at Vernet (Lemann); July 31st, 1894, at Randa (Reverdin); July 12th, 1895, at Martigny (Blachier); July 18th-20th, 1895, at Pejo, July 21st-24th, 1895, at Campiglio (Lemann); July 28th-31st, 1895, on the Mendel Pass, August 2nd-14th, at Cortina, August 9th, 1895, on the Croda di Lago, August 11th, 1895, in the Val Bigontina, August 12th, 1895, on the Sorrapis, August 18th and 19th, at Bregenz (Tutt); July 25th, 1895, at Divonne (Reverdin); July 15th, 1896, at Ragatz (Reverdin); July 25th, 26th, 1896, at Grésy-sur-Aix, July 28th, 1896, at St. Michel-de-Maurienne, July 30th-August 5th, 1896, at le Lautaret, August 5th-12th, 1896, at la Grave, August 12th-19th, 1896, at Bourg d'Oisans, August 18th, 1896, at Bourg d'Arud (Tutt); August 2nd, 1896, at les Avants-sur-Montreux (Rowland-Brown); August 15th, 1896, at Pfenningsberg, near Linz (Himsl); April 29th-May 8th, 1897, at Hyères (Buckmaster); June 28th, 1897, at Fontainebleau (Tutt); July 1st-8th, 1897, near Sépey, August 6th-27th, 1897, at Bérissal (Wheeler); July 10th, 1897, at Kokaleny (Bachmetjew); July 20th, 1897, at Campfer, in the Upper Engadine (Jones); July 21st-27th, 1897, at Heiligenblut (Lemann); July 26th-August 2nd, 1897, at St. Michel-de-Maurienne, August 3rd-8th, 1897, at Lanslebourg, August 11th-18th, 1897, at Susa, August 19th-20th, at Grésy-sur-Aix (Tutt); July 30th, 1897, at Bérissal, middle of August, 1897, at Saas Fée (Rowland-Brown); August 4th, 1897, at Pont de l'Arche (Dupont); July 8th-August 30th, 1898, at Bérissal (Wheeler); July 11th, 1898, on the Baba Planina, just coming out (Nicholl); July 24th, 1898, at Igman (Burr); end of July, 1898, at Sierre, beginning of August, 1898, at Zinal, middle of August, 1898, at Neuchâtel (Rowland-Brown); July 28th-29th, 1898, at Grésy-sur-Aix, August 1st-6th, 1898, at Bourg St. Maurice, August 7th, 1898, up to about 5500ft. on the French side of the Little St. Bernard, August 9th-16th, 1898, at Pré St. Didier and Courmayeur, August 18th-19th, 1898, at Aosta (Tutt); June 7th, 1899, at Digne,\* June 23rd-30th, just coming out at Susa (Rowland-Brown); July 1st-12th, 1899, at Fusio, July 16th-20th,

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\* Possible double-brooded areas, requiring investigation.



1899, at Macugnaga, July 26th-August 3rd, 1899, on the Simplon (Chapman); July 15th-August 25th, 1899, in the Brenner district (Galvagni); July 28th-August 2nd, 1899, on the Simplon Pass above and below Simplon, August 2nd, 1899, between Bérisal and summit of Simplon Pass, August 3rd, 1899, between Useigne and Evolène, August 4th-12th, 1899, at Evolène, August 14th, 1899, abundant in the Ferpécle Valley, August 15th-20th, at Arolla, August 22nd-24th, 1899, at Fontainebleau (Tutt); August 25th-September 6th, 1899, on the Rigi (Sanford); June 6th, 1900, at Orta (Lowe); June 19th, 1900, at Feistenberg (Hafner); June 23rd and 24th, 1900, at Montsény (Witty); July 1900, singly on the Görlitz Heath (Marschner); July 5th, 1900, from Thusis to Splügen, not in the Chiesa valley above Sondrio, July 11th, 1900, at Bormio, on the Stelvio till the middle of the month, July 27th, 1900, at Brenner (Rowland-Brown); July 19th-25th, 1900, at Cortina, July 31st, 1900, at Lago di Loppio (A. H. Jones); July 21st-August 9th, 1900, in the Brenner district (Galvagni); July 22nd-31st, 1900, at Guarda (Chapman); July 30th, 31st, and August 8th, 1900, at Barcelonnette, August 1st-7th, 1900, at Larche, August 9th-16th, 1900, at Abriès, August 13th, 1900, on the Pointe de la Lauze, August 18th-24th, 1900, at Grésy-sur-Aix (Tutt); August 1st, 1900, near Gimelwald (Wheeler); May 9th-13th, 1901, at Caldas de Maravilla,\* May 21st, 1901, on the southern slope of the Sierra Nevada,\* July, 1901, at Buerda, July 14th-15th, between Serajevo and Gorazda, July 16th, 1901, between Focha and Celebic (Nicholl); July 9th-16th, 1901, at Cuenca, July 18th-26th, 1901, at Tragacete, July 28th-August 6th, 1901, at Albarracin, August 3rd-5th, 1901, at Bronchales (Chapman); July, 1901, at le Sépey (Lemann); July 12th, 1901, at Loèche (Blachier); July 16th-August 5th, 1901, in the Cevennes, July 20th, 1901, on the Empezon, Florac (Rowland-Brown); July 26th, 1901, at Igman (Rebel); July 31st-August 5th, 1901, at Torre Pellice, August 3rd, 1901, at Crissolo, August 9th-18th, 1901, at Bobbio, August 18th-22nd, 1901, at Au Pra, August 20th, 1901, almost to the summit of the Col de la Croix, at 7500ft. elevation (Tutt); August 8th, 9th, 1901, on the slopes of Pilatus between Hergiswyl and the summit (Keynes); August 10th, 1901, at Jaice (Penther); July 12th, 1902, just appearing at Aigle (Sheldon); July 12th, 1902, and following days near Villars (Moss); July 17th-August 3rd, 1902, at Maklenpass (Hilf); about July 23rd, 1902, at Avila (Chapman); July 25th, 1902, at Grésy-sur-Aix, July 29th-31st, 1902, at Chavoire, August 4th, 1902, at la Clusaz, August 5th-12th, at Megève, August 18th, 1902, on the Brévent (Tutt); August 2nd, 1902, in the Pas-de-Calais, October 16th, 1902, fairly fresh at Digne (Rowland-Brown); August 7th, 1902, at Vallorbe, September 2nd, 1902, near Sonzier (Wheeler); August 15th, 1902, at Han-sur-Lesse (Sibille); August 16th, 1902, at Versoix (Blachier); September 9th, 1902, at Follaterre (Wheeler); May 22nd, 1903, at Chiavari,\* July 20th, 1903, at Almogel, August 2nd, 1903, on Mt. Vuache, August 26th, 1903, in the Val d'Abondance (Blachier); July, 1903, in thousands on the Simplon Pass (Lemann); July 2nd, 1903, between Brünig and Meiringen, very fine and abundant (Keynes); July 7th, 1903, in the Pfynwald (Wheeler); July 12th, 1903, at Aigle, July 16th-

\* Possible double-brooded areas, requiring investigation.

17th, 1903, on the Col de la Forclaz, July 20th, 1903, at Bérissal, July 29th, 1903, at Brigue (Sheldon); July 13th, 1903, in the Laquinthal, July 28th, 1903, at second refuge, Bérissal, July 31st, 1903, between Sion and Vex, August 14th, 1903, very small but very abundant at Barmaz, August 30th, 1903, at les Avants (Wheeler); July 12th-24th, 1903, between Moncayo and La Cueva de Agreda, July 25th, 1903, at Soria (Chapman); July 26th, 1903, at St. Martin-Vésubie (Rowland-Brown); July 27th, 1903, at Roche near Aigle, July 28th, 1903, near Useigne, July 29th, 1903, between Haudères and Arolla, July 29th-August 11th, 1903, at Arolla, August 13th, 1903, between Evolène and Useigne, August 14th, 1903, on the Col de la Forclaz, August 17th, 1903, on the slopes above the Mauvais Pas (Tutt); August 2nd, 1903, in the Val Cairasca, August 3rd, 1903, in the Laquinthal (Reverdin); April 30th, 1904, at Ste. Maxime,\* one on May 11th, 1904, at Pont du Gard,\* July 3rd-22nd, 1904, at Puerto de Pajares (Chapman); June 10th, 1904, at Jaca, July 13th, 1904, at Montserrat (Burr); July, 1904, in South Tyrol (Lemann); July, 1904, rare at Waulsort, July, 1904, common at Florennes, August, 1904, at Han-sur-Lesse (Derenne); July 1st, 1904, above Grindelwald (Lowe); July 1st, 1904, at Saas-Grund (Morel); July 7th-17th, 1904, at Brides-les-Bains, July 10th, 1904, at Salins, August 3rd and 4th, 1904, at Saas-Fée, August 6th, 1904, on the Almagel-alp (Reverdin); July 8th, 1904, at Mödling, near Vienna (Rowland-Brown); July 10th, 1904, at Digne, July 21st, 1904, on the Col Ferret (Muschamp); July 14th, 1904, at Vevey (Keynes); July 15th-17th, 1904, in swarms at Digne, July 25th-30th, 1904, at Clelles (Sheldon); July 18th, 1904, on the Alpe Pianascio (Wheeler); July 22nd, 1904, at Gex, August 3rd, 1904, at Hermance, August 5th, 1904, on Mt. Vuache (Blachier); July 24th, 1904, at St. Moritz (Bartel); July 26th, 1904, on the Col de la Faucille, July 28th, 1904, abundant at Monnetier on the Grand Salève, July 29th and August 1st, 1904, at the foot of the Grand Salève, July 30th, 1904, at Gex, August 5th, 1904, in the Saas-Thal above Stalden, August 6th, 1904, between Saas-Grund and Mattmark, August 7th, 1904, between Saas-Grund and Balen, August 8th-13th, 1904, at Saas-Fée and Saas-Grund, August 15th-17th, 1904, above Zermatt and in the Visp-Thal (Tutt); July 29th, 1904, at Nikolsburg, in Moravia (*Skala teste* Gillmer); August 5th, 1904, at Navalparal (Chapman); April 23rd, 1905, at Granada,\* June 12th, 1905, at Martigny, July 31st, 1905, on the Salève (Muschamp); April 25th, 1905, freshly emerged at Plan du Pont, near Hyères,\* May 3rd, 1905, at Draguignan,\* May 9th, 1905, at Pont du Gard\* (Tutt); June 10th, 1905, at Barcelona\* (Jones); June 16th, 1905, at Montserrat, June 17th-27th, 1905, at Vernet-les-Bains (Stan-  
den); June 29th-July 13th, 1905, between Lauterbrunnen and Wengern (Moss); July 12th, 1905, in the Val Antigorio, July 13th, 1905, at Iselle, July 25th, 1905, at Bérissal, July 30th, 1905, at Bellegarde, August 18th, 1905, at Alpien (Blachier); July 13th, 1905, at Brides-les-Bains, July 25th and 27th, 1905, at Salins, August 10th-14th, 1905, at Chandolin (Reverdin); July 19th, 1905, at Port de Saldeu, 8339ft., in Andorra, July 24th, 1905, at Gavarnie (Rowland-Brown); July 21st-30th, 1905, at Larche, August 1st-10th, 1905, at le Lautaret (Chapman); July 26th and 27th, 1905, at Berchtesgaden (Bentall); July 27th-August

\* Possible double-brooded areas, requiring investigation.

5th, 1905, near Albarracin, August 7th, 1905, at Noguera (Sheldon); July 28th-31st, 1905, at Grésy-sur-Aix, August 1st-5th, 1905, at Bourg St. Maurice, August 8th-13th, 1905, at Pré St. Didier and Courmayeur, August 14th-16th, 1905, at Val Tournanche, August 19th, 1905, at Châtillon, August 22nd, 1905, in the Val Anzasca, August 25th, 1905, at la Bâtiâz (Tutt); August 2nd, 1905, at Chur, at the foot of the Mittenberg (Lowe); August 4th, 1905, at Gavarnie, abundant on the road to Gèdre (Turner); August 3rd-4th, 1905, in the Pfynwald, August 19th-21st, 1905, above Binn (Keynes); August 5th, 1905, on the Nanos, August 10th, 1905, at Weissenfels (Hafner); April 6th, 1906, at Pardigon\* (Reverdin); April 8th, 1906, at Hyères,\* May 30th, June 10th, at Digne,\* August 1st, September 3rd, 1906, at Geneva, July 27th, 1906, on the Dent du Midi (Muschamp); April 20th-May 10th, 1906, abundant at Ste. Maxime-sur-Mer\* (Chapman); May 17th, 1906, at Digne,\* July 10th, 1906, at Fusio, July 16th, 1906, in the Val Maggia, July 18th, 1906, in the Val Anzasca (Blachier); July 10th, 1906, at Iselle, August 27th, 1906, at Fiesole (Wheeler); July 10th, 1906, at Digne (Muschamp); July 10th, 1906, at Branson, July 12th, 1906, at Simplon, July 19th-August 2nd, 1906, at Arolla, August 11th, 1906, at Follaterre, August 22nd, 1906, at Martigny (Reverdin); July 30th-August 6th, 1906, abundant at Clelles, August 4th-6th and 19th, 1906, at Digne, August 8th-9th, 1906, abundant at Beauvèzer, August 10th, 1906, between Allos and the Lac d'Allos, August 9th-17th, 1906, between Allos and Colmars, August 21st, 1906, at Grésy-sur-Aix, August 23rd, 1906, at Versoix (Tutt); August 3rd-22nd, 1906 (*ab. tithonus*), at Nuits, Côte d'Or (Rehfous); August 8th, 1906, at Engelberg, common towards Flühmatt (Turner); April 10th-28th, 1907, at Ste. Maxime\* (Chapman); in May, 1907, at Brantes, Vaucluse\* (coll. H. Brown); June 24th, 1907, at Digne, July 27th, 1907, in the Val Vigezzo, August 3rd, 1907, at Satigny, August 31st, 1907, at le Sépey (Blachier); June 26th, 1907, near Vissoye (Pearson); June 28th, 1907, above Wippach (Hafner); July 5th-7th, 1907, at Martigny, July 8th, 1907, at Ganter, July 13th, 1907, on the Rossboden Alp, July 15th, 1907, at Savièze (Rehfous); July 9th-30th, 1907, at Gavarnie, August 1st-8th, 1907, at Caunterets (Chapman); July 15th, 1907, at Bérisal, July 26th, 1907, at Binn (Rowland-Brown); July 26th-31st, 1907, at Versoix, August 25th, 1907, at Randa, August 27th, 1907, on the Täschalp (Reverdin); July 29th, 1907, about half-way up the Rigi, July 31st, 1907, on the Axenstrasse, August 6th, 1907, in the Suvrettathal (Turner); July 29th-31st, 1907, at Göschenen, August 1st, 1907, in the Val Bedretto, August 2nd, 1907, between Airolo and Brugnasco, August 3rd, 1907, on the southern slopes of the St. Gothard Pass, August 4th and 7th, 1907, at Piotta, abundant, August 5th, 1907, between Faido and the Piottino Gorge, August 8th, 1907, all the way from Airolo to Piora, August 13th, 1907, common between St. Moritz and Pontresina, August 14th, 1907, in the Roseg Valley, August 14th-18th, on the Albula Pass, August 19th, 1907, at Preda, August 23rd, 1907, in the Via Mala (Tutt); August 15th-22nd, 1907, at Evolène (Page); August 26th, 1907, at St. Adrien, near Rouen (Oldaker); September 7th, 1907, at Fiesole (Wheeler); April 11th-19th, 1908, at Pardigon\* (Reverdin);

\* Possible double-brooded areas, requiring investigation.

June 20th, 1908, at Lantillac (Chabot); July 2nd-5th, 1908, at Glion, July 7th-17th, 1908, at Vissoye, July 19th-31st, 1908, at Saas-Fée, August, 1908, at Binn (Chapman); July 7th, 1908, on Mt. Salève, July 14th-September 15th, 1908, at Veyrier (Blachier); July 10th, 1908, in the Klönthal, Glarus (Muschamp); July 11th, 1908, in the Pfynwald, August 2nd, 1908, at Versoix, August 8th, 1908, at Bérissal, August 11th, 1908, at Schallberg, August 12th, 1908, at Sierre, August 15th, 1908, at Gondo (Reverdin); July 25th, 1908, at Martigny, July 27th, on the Col de la Forclaz, August 2nd, 1908, by the Glacier du Trient, August 10th, near Lavancher, August 14th, at Zermatt and by the Findelen Glacier, August 20th, 1908, in the Zmuttthal (Page); July 27th, 1908, at Gersau, July 30th, 1908, at Seeberg, August 3rd, 1908, at Bürgenstock, common towards Stansstad, August 10th, 1908, at Vitznau, common, August 12th, 1908, at Brunnen (Turner); July 28th, 1908, just appearing between Einsiedeln and Biberbrücke, August 3rd-5th, 1908, in the Dischmathal, rare, August 4th, 1908, in the Landwasserthal, August 6th, 1908, in the Sertigthal, rare, August 8th, 1908, on the Fluela Pass, August 9th-10th, 1908, at Sus and Lavin, August 11th-12th, 1908, at Zernetz and on the Ofen Pass, August 13th, 1908, in the Muranzathal, August 14th, 1908, at Santa Maria and Munster, August 15th, 1908, on the Wormser Joch, and between Franzenshöhe and Trafoi, August 17th, 1908, at Trafoi, Gomagoi, and Suldén (Tutt); August 1st, 1908, at Barcelonnette, and onward in the Basses-Alpes to the end of the month (Rowland-Brown); May 6th, 1909, between Cavalaire and le Canadel\* (Wheeler); May 8th, 1909, in the Forêt du Dom\* (Powell); June 6th, 1909, at Ambérieu, July 31st-August 1st, 1909, at Alleverd, August 7th and 16th, 1909, at Versoix, August 11th, 1909, at Tougues, August 14th, 1909, in the Bois Taille, August 30th, 1909, at Budafok, September 2nd, 1909, at Isaszeg, September 16th, 1909, at Veyrier (Reverdin); June 18th and 21st, 1909, at Fiesole, July 22nd (just out)-August 11th, 1909, at Assisi, July 27th, 1909, between Assisi and Gubbio, August 20th, 1909, on Monte Oliveto (Wheeler); July 10th-30th, 1909, in the Val d'Hérens (Chapman); July 22nd, 1909, at Brides-les-Bains, July 23rd, 1909, at Moutiers, August 8th, 1909, at Varzo, August 18th, 1909, at Bérissal (Blachier); July 25th-August 1st, 1909, at la Grave (Lowe); July 24th-27th, 1909, at Staefa, July 29th, 1909, on the Weesen Marsh, August 1st-2nd, 1909, at St. Anton, August 5th, 1909, in the Eggenthal, August 6th, 1909, in the Sarnthal, August 8th, 1909, at Mendel, August 11th and 12th, 1909, at Neu Spondinig, August 13th, 1909, between Neu Spondinig and Trafoi, August 14th, 1909, between Trafoi and Ferdinandshöhe, August 15th, 1909, from Ferdinandshöhe to Bormio Bad, August 18th, 1909, above Pontresina on the Piz Languard (Tutt); July 28th, 1909, on Mt. Cairo, July 28th, 1909, near Cassino (Barraud); middle of August, 1909, very fine in Lozère at Mende (Rowland-Brown). BRITISH LOCALITIES: The species occurs from July to September; the statement made by Newman that the imago appears at the end of May, the whole of June, and beginning of July is entirely erroneous for England. Hodgson has given us (*in litt.*) the following details of the earliest and latest dates noted for this species the last few years:

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\* Possible double-brooded areas, requiring investigation.

YEAR.	EARLIEST CAPTURES.	LOCALITY.	LATEST CAPTURES.	LOCALITY.
1903	July 18th (♂s only)	Brighton	September 18th	Lancing
1904	July 27th	Reigate	well into September	Reigate
1905	July 19th	Reigate	September 3rd and 4th	Reigate and Lewes
1906	July 11th	Reigate	September 8th	Clandon
1907	July 20th	Dover	September 11th	Sussex and Surrey
1908	July 17th	Dover	September 23rd	Dover

Granting that the species was out at least some days earlier and later than the dates here noted, it is clear that the species is usually two months on the wing, this period being largely (or entirely) dependent on the difference in the rate at which the larvæ feed up. The following dates have been collected from various sources—July 4th, 1833, on the Devil's Ditch, Cambridge (Stephens); September 13th, 1845, on the downs near Godstone Road (Stainton); September 6th, 1855, plentiful at Hollingbury Coombe (Image); July 25th, 1856, in Wychwood Forest (*E.W.I.*, i., p. 147); August 1st-4th, 1856, at Cirencester (Bingham); August 3rd, 1856, near Newmarket, very abundant (Wagstaff); August 5th, 1856, near Newhaven (Reeve); August 14th, 1856, abundant at Hollingbury Coombe (Image); July 16th-August 1st, 1857, in the Forest of Dean (Langley); about July 16th, 1857, near Cambridge (Balls); July 17th-21st, 1857, near Ramisbury (Rye); July 21st-25th, 1857, at Bristol (Bingham); July 23rd, 1857, at Figheldean, near Amesbury (Caswall); August, 1857, near Reigate (Tugwell); August 16th, 1857, near Carisbrooke Castle (James); August 18th, 1857, at Dover (Hayward); July 15th-20th, 1858, near Deal (Baldwin); July 18th, 1858, at Riddlesdown, abundant (Fisher); July 25th, 1858, abundant at Croydon (Killingsback); July 29th, 1858, at Chevening, near Sevenoaks (Stanhope); July 31st, 1858, near Chatham (Tyrer); August 1st-2nd, 1858, at Riddlesdown (Lamb); August 3rd-September 17th, 1858, at Ashford (Russell); August 3rd-5th, 1858, at Leckhampton (Trye); August 15th, 1858, near Croydon (Gregory); August 25th-September 15th, 1860, at Folkestone, Dover, and Ventnor (Fereday); September 1st-13th, 1860, at Deal (Fenn); a late season, seen up till October 4th, 1860, at Deal (Harding); a ♀ August 14th, 1864, in Ladbroke Square, Notting Hill (A. H. Clarke); July 27th, 1865, at Gurnard Bay, Isle of Wight (Gibson); August 16th-30th, 1865, between Dover and Sandgate (Cox); July 24th, 1868, on Painswick Hill (C. J. Watkins); one ♂ September 1st, 1868, on the beach at Southsea, supposed to have crossed from the Isle of Wight (Moncreaff); August 21st, 1869, very plentiful at Hollingbury Coombe (Image); imagines appeared July 6th-9th, 1870, from pupæ that had been in that stage from June 13th (Newman); August 5th-21st, 1871, in the Rhinefields Sandy enclosure in the New Forest (Lockyer); July 16th-30th, 1874, at Eastbourne (Shearwood); July 9th, 1875, in the Marlow district (A. H. Clarke); August 27th, 1876, at Ventnor (Bower); beginning of August, 1877, at Bembridge (Rowland-Brown); October 4th, 1877, at Wootton-under-Edge (Perkins); July 28th, 1878, in the Marlow district (A. H. Clarke); August 24th, 1879, at Cuxton (Bower); beginning of August, 1879, very plentiful on Hunstanton downs (Rowland-Brown); September

15th, 1879, abundant at Lewes (Jenner); July 5th-26th, 1882, at Folkestone (Salwey); August 1st, 1882, abundant near Croydon (Frohawke); August 3rd-6th, 1882, between Walmer and St. Margaret's (Hodgson); August 7th, 1882, at Box Hill (Bower); September 3rd, 1882, in the Marlow district (A. H. Clarke); September 16th-23rd, 1882, at Folkestone (Hall); July 7th, 1883, just emerging in the Dover district (Coverdale); July 28th-31st, 1883, in the Isle of Purbeck (Banks); August 2nd, 1883, near Ely (Archer); July 24th-31st, 1884, on the Devil's Dyke, Cambridge (Peed); July 29th, 1885, at Loughton (Bishop); July 30th, 1885, on the downs near Freshwater (Hawes); August 5th, 1885, in the Isle of Purbeck (Banks); end of August, 1885, on Barnes Common (Sharp); September 4th-7th, 1886, at Folkestone (Sabine); July 24th-August 21st, 1887, at Kingsdown, and on the South Foreland (Tutt); July 30th, 1887, at Blandford (Smith); July, 1887, one near Enfield (Sykes); August, 1887, on Lundy Island (Tutt coll.); August 1st, 1887, near Hounslow (Rendall); August 1st-16th and 28th-September 16th, 1887, at Eastbourne (Adkin); August 2nd, 1887, in the Isle of Portland (Banks); August 6th, 1887, at Beckenham (Reid); August 10th, 1887, at Groombridge and on Broadwater Common (Blaber); August 12th, 1887, near Chatham (Sabine); August 15th-19th, 1887, worn, at Cuxton (Tutt); August 16th, 1887, at Lulworth (McMurtrie); July 22nd, 1888, in the Marlow district (A. H. Clarke); July 31st, 1889, common at Purley (Bower); August 23rd, 1888, at Gussage St. Michael (Ward); September 12th, 1888, at Lulworth (Luff); July 21st, 1889, in the Marlow district (A. H. Clarke); July 25th, 1889, in the Isle of Purbeck (Banks); July 28th, 1889, at Lewes, August 2nd, 1889, at Caterham (Turner); July 28th-August 15th, 1889, at Freshwater (Tutt); July 31st, 1889, at Purley (Bower); August 4th, 1889, at Portsdown Hill (Pearce); July 24th-August 20th, 1890, at St. Margaret's and Deal (Tutt); August 1st, 1890, at Riddlesdown, August 6th, 1890, at Redhill (Turner); first appeared August 5th, 1890, and continued to September 16th, at Chinnor (Spiller); August 30th, 1890, at Folkestone (Carpenter); June 20th, 1891, at Eynesford, August 13th, 1891, at Riddlesdown (Turner); July 20th, 1891, at Kingsdown (Fenn); August 1st-September 3rd, 1891, at Eastbourne (Adkin); August 8th, 1891, at Swanage (Beales); August 11th, 1891, abundant at Box Hill (T. Bainbrigge-Fletcher); abundant by July 25th, 1892, at Brean Down (Prideaux); July 25th-26th, 1892, at Freshwater (Henderson); July 29th-August 1st, 1892, at Swanage (Bloomfield); August 1st-14th, 1892, most abundant at Beachy Head (Griffith); August 4th, 1892, at Wimborne and Blandford (Banks); August 5th, 1892, and following days, at Folkestone (Adkin); August 10th, 1892, at Canterbury (Parry); August 17th, 1892, in the Stroud district, latest date ever noticed in the district (Davis); August 20th, 1892, at Reigate (Turner); August 22nd, 1892, at Fair Mead, Epping Forest (Argent); July 1st and 22nd, 1893, at Cuxton (Tutt); July 1st-13th, 17th, 1893, at Eastbourne (Thornewill); July 15th, right on to September 2nd, 1893, at Sandown, Isle of Wight (Prout); in profusion, but worn by July 29th, 1893, at Dorking (Prideaux); August 1st-25th, 1894, at Folkestone (Page); August 2nd, 1894, at Clandon (Turner); August 3rd, 1894, at Park Down (T. Bainbrigge-Fletcher); August 3rd, 1894, on Polegate downs (James); several ♀s still out, September 11th, 1894, at Carisbrooke (Prideaux);



July 10th, 1895, at Reading (Clarke); from July 22nd, 1895, to the end of August, in profusion in the Isle of Wight (Prideaux); August 6th, 1895, at Clandon (Turner); July 19th, 1896, first appearance at Dorking (Prideaux); July 21st, 1896, earliest date noted at Ashford (Wood); July 28th-August 16th, 1896, at Folkestone (Page); July 27th, 1897, at Sandown, Isle of Wight (Bell); August 2nd, 1897, near Shere (Tremayne); between August 5th and September 9th, 1897, at Swanage (Hall); August 11th-20th, 1897, in the Painswick district (Stephens *teste* Watkins); August 16th, 1897, at Hollingbury Coombe (Image); July 18th, 1898, at Reigate (Prideaux); July 20th-August 1st, 1898, on the Devil's Dyke, Cambridge (Peed); August 14th and 15th, 1898, abundant on the London Road between Wincanton and Salisbury (Tetley); August 26th, 1898, in poor condition at Riddlesdown (Bower); September 3rd, 1898, in the Wendover district (Rowland-Brown); July 29th, 1899, in the Marlow district (A. H. Clarke); August 3rd, 1899, swarming on the chalk-hills near Kimble (Rowland-Brown); August 7th, 1899, near Otford (Battley); August 11th, 1899, at Hunstanton (Raynor); August 11th, 1899, abundant, some worn, at Riddlesdown (Bower); August 27th, 1899, at Horsley (Bell); July 22nd-September 6th, 1900, at Reigate (Prideaux); July 26th-September 10th, 1900, at Burgess Hill (Dollman); July 26th, 1900, in the Marlow district (A. H. Clarke); July 31st, 1900, at Shoreham, Kent (Bower); August 11th-27th, 1900, at Folkestone (Pickett); August 13th-20th, 1900, at Newbury (Hopson); August 19th, 1900, one ♂ at Horspath, near Oxford (Hamm); August 21st, 1900, latest date noted this year at Ashford (Wood); September, 1900, at Aldbury (Cottam); July 17th, 1901, in the Stroud district, earliest date for this locality (Davis); July 24th, 1901, at Reigate (Prideaux); August 1st, 1901, common at Shoreham, Kent (Bower); August 3rd, 1901, on Aldbury Down (Barraud); August 3rd-September 7th, 1901, at Ditchling Beacon, August 28th, 1901, near Lewes (Dollman); August 9th-23rd, 1901, at Cuxton (Burrows); August 16th-21st, 1901, at Freshwater (J. Gardner); August 23rd, 1901, on the downs between Shoreham and Worthing roads (Bird); July 13th, 1902, in the Marlow district (A. H. Clarke); July 17th, 1902, in the Stroud district, earliest date of year (Davis); July 23rd-September 13th, 1902, at Enstone, August 18th, 1902, in countless thousands at Wallington (Cruttwell); July 29th, 1902, first appearance at Reigate (Prideaux); August 2nd, 1902, near Chichester (Ash); August 2nd, 1902, at Shoreham, Kent (Bower); August 5th-September 13th, 1902, at Burgess Hill (Dollman); August 5th-11th, 1902, on the downs between Shoreham and Worthing roads (Bird); August 9th, 1902, and following days, at Folkestone (Pickett); August 27th, 1902, at Cuxton (Burrows); September 5th, 1902, two at Caterham (Bower); September 6th, 1902, between Princes' Risborough and Kimble (Rowland-Brown); September 7th, 1902, near Dover (Sloper); September 18th-25th, 1902, at Eastbourne (Adkin); July 17th-August 5th, 1903, on the downs between Shoreham and Worthing roads (Bird); July 18th, 1903, just appearing at Clandon, August 1st-19th, 1903, at Dover (Pickett); July 19th-September 17th, 1903, at Reigate (Prideaux); July 25th-26th, 1903, near Tring (Barraud); July 17th, 1904, first appearance at Dorking (Prideaux); July 23rd, 1904, in the Marlow district (A. H. Clarke); August 1st, 1904, at Reigate (Brown); August 8th, 10th, 1904, in the Isle of Purbeck (Bankes); August 10th-

29th, 1904, July 11th-24th, 1905, at Cuxton (Burrows); July 20th, 1905, at Dorking (Prideaux); July 24th, August 2nd, 1905, in the Isle of Purbeck (Bankes); July 29th, 1905, at Eastbourne (Colthrup); August 8th, 1905, one ♂ at Shotover (Hamm); August 13th, 1905, at Horsley (Bell); August 14th, 1905, common at Shoreham, Kent (Bower); August 15th, 1905, at Dorking (Oldaker); August 26th, 1905, one ♂ at Abertillery (Rait-Smith); July 14th, 1906, at Horsley, just appearing (Kaye); July 25th-August 1st, 1906, at Shoreham, Kent (Bower); August 4th, 1906, between Princes' Risborough and Kimble (Rowland-Brown); August 8th, 1906, near Tubney, one ♂ (Hamm); August 8th, 1906, at Newbury (Hopson); one ♂, August 11th, 1906, at Tintern (Bird); still out September 16th, 1906, in the Isle of Wight (Newman); July 13th-29th, 1907, at Freshwater (James); July 30th, 1908, at Riddlesdown (Bower); August 5th, 1907, at Swanage (Jane); August 9th, 1907, at Freshwater (Pearce); September 1st, 1907, at Horsley (Bell); September 12th, 1907, between Princes' Risborough and Kimble (Rowland-Brown); September 15th, 1907, near Cuxton and Halling (Tutt); August 6th and 17th, 1908, near Beer Head (Blathwayt); September 13th, 1908, between Princes' Risborough and Kimble (Rowland-Brown); August 21st, 1909, only ♂s met with, and these very scarce where in all previous years at the same places they abounded, between Princes' Risborough and Kimble (Rowland-Brown); September 9th, 1909, at Royston (Wheeler).

**HABITS.**—Locally abundant as this species is in England, it is not until one has collected over a considerable area in central Europe, especially in the Alps, that one is convinced that this is the commonest of all our "blues," but this idea is now firmly fixed in our own mind, and, although such a notion is necessarily relative, it will explain why our notes on its habits and habitats possibly exceed those of any other species of "blue" that has come under our observation. Except when collected around runnels and puddles in vast swarms, we have never seen the insect more abundant than on the cliffs at Dover, the downs at Cuxton and Freshwater, and similar localities in England. Here, seated on the flowers or flying in the hot sun, the number of specimens in really good seasons is remarkable. We can fully understand the remarks that the ♂s occurred in countless numbers in August, 1901, on Ditchling Beacon, in splendid condition, and made a beautiful sight, drifting with the light breeze as far as one could see (Dollman), and that, in August, 1902, it was in countless thousands at Watlington, all very small, but so inert that they allowed themselves to be trodden upon (Cruttwell); we have seen it equally abundant on the cliffs at Dover, yet not in all seasons, for, in some years, scarcely a specimen has been obtainable in the same spots as those in which it has been so abundant in previous years. *A. coridon* is a beautiful and conspicuous insect, and the ♂ certainly appears to be one of the boldest fliers of all the "blues;" sometimes sweeping along in rapid curves, at other times darting swiftly almost straight ahead, or moving in short curves or zigzags through the undergrowth, now turning rapidly to give chase to the largest butterflies that cross its path, flying after *Argynnis aglaia* and *A. niobe* with great boldness, and showing fight at almost anything that disturbs it; when perched on a flower-head it will similarly leave its food to attack almost any butterfly that approaches. The ♂ is particularly active in the forenoon, and may sometimes be seen following up a ♀ in the most persistent fashion, and, when at



last the ♀ settles, he will drop instantly so as to sit an inch or two behind her, the wings of both, as a rule, vibrating rapidly all the time. As he approaches her, she usually faces him, and they will then push each other head to head, round and round in eddying circles, never losing their foothold on the leaf or other object, the ♀ generally keeping her abdomen well raised, and both with the wings some little distance apart. When she rises they continue the movements in the air, eddying swiftly around each other in small circles, sometimes rising to a great height, and then falling almost simultaneously, the ♂ taking up a position behind the ♀ as before, the hindwings vibrating all the while. The continuous raising of the abdomen of the ♀ appears to be a signal for the withdrawal of the ♂; sometimes two or three ♂s may be thus seen gyrating round a single ♀, but usually one ♂ drives the others away so that he is left in sole possession, but he, too, leaves her later, for this is not a prelude to pairing, the ♀ having already paired, and we have yet to learn the meaning of the sexual attraction which the ♂s and ♀s of almost all species appear to have for each other when there is no possibility of pairing being the ultimate result. The pairing habit of this species is usually exceedingly simple and rapid. We have often observed it, and it is very similar in almost all cases. On August 1st, 1909, near St. Anton, in Vorarlberg, about 9.30 a.m., on a flowery bank in the hot sun, 2 ♂ *A. coridon* were observed hovering a moment just in front of us, and then dropped almost simultaneously on the stem of a plant upon which a newly-emerged ♀ was observed with her wings fully expanded but hardly dry, so that the hustling of the ♂s pushed the rather soft wings from side to side; the ♂s settled first one on either side of her, each extending its abdomen to the utmost, curling it round in a widely-extended curve with the pale brown clasps fully distended, and turning them round in an attempt to catch hold of the end of the abdomen of the ♀; at this time the ♀ kept her abdomen well covered by the inner margins of the hindwings, and slowly moved up the stem on which she was standing, the ♂s following her up, and heading in exactly the same direction, continuously pushed her from one side to the other, until at last she dropped from her perch and fell a few inches upon an almost upright slab; both the ♂s lost her and circled round evidently attempting to pick up the scent; at first they failed entirely, but, after perhaps a couple of minutes, one of them dropped quickly to her left side and immediately protruded his claspers, curled round his body, and running alongside her as she moved upwards, attempted to catch hold of the abdomen which was now hanging below the hindwings, the ovipositor being clearly visible; the other ♂ flew down by the side of the first ♂, and curving his abdomen, the two ♂s interfered a great deal with each other; suddenly the second ♂ pushed forward the first ♂, and almost at the same moment caught hold of the tip of the abdomen of the ♀ with his claspers; the first ♂ flew to the other side of the ♀, but, although he was a larger and apparently stronger specimen, he failed entirely to remove the claspers of the other ♂, and in a few seconds flew off; the other ♂ now placed himself behind the ♀ facing in the opposite direction, and thrust upwards with his abdomen two or three times before union was permanently effected; this being done both butterflies were placed in a large glass-topped box, and were still paired when next looked at about 6 p.m. They were, however,

separated next morning. The ♀ in this species, as in others, appears to have no choice whatever in the matter. If disturbed when paired, the ♂ takes to flight and carries the ♀, as is the case apparently with all Lycænids. The only actual records of cross-pairing that we can trace, are (1) by Sabine, who states (*Proc. Sth. Lond. Ent. Soc.*, 1886, p. 61) that he once took a ♂ *A. thetis* in cop. with a ♀ *A. coridon*, (2) by Bankes, who reports (*in litt.*) that on August 4th, 1892, he found a ♂ *A. coridon* in cop. with a ♀ *Coenonympha pamphilus*, which separated just as he was netting them, and after two or three short flights had been made. When a ♂ is fluttering along, or up and down a flowery bank, and one is standing above and looking down on the insect, the blue of the upperside rarely disappears even for a moment, in spite of the twinkling appearance that suggests that the grey underside of the wings is being regularly thrust up as flight continues. One also observes the remarkable way in which the costa of the forewings is apparently thrust back during flight, giving the insect sometimes a rather dwarfed appearance. Viewed sideways, however, one sees the wings thrown up so as to show the undersides alternately with the upperside in the horizontal forward movement. This seemingly inquiring mode of flight is entirely different from the sudden dart which the insect takes when suddenly disturbed, and which carries it at once to a considerable distance, and it is also different from the long sweeping movement in forward curves that one observes when the ♂ is flying hurriedly but has not been rudely disturbed. When the weather is bright, both sexes love to sit in the sun, but they do not sit indolently with the wings outspread to anything like the same extent that *A. thetis* does. They will sit and feed and move their hindwings alternately in the manner of the other species, or find a damp spot, where they will sit for hours, but they are more restless otherwise than their congeners, although one sometimes sees them sunning, when, with wings expanded horizontally, and hindwings pulled back, perched generally on the summit of a tall flower or head of grass, they swing themselves round at the apex, so that the wings are fully exposed to the sun, they form a beautiful picture; this is particularly the case in the afternoon, but, when the weather is hazy, and the sunlight somewhat diffused, the ♂s appear to attempt to get all the warmth possible from the sun, resting on grass-culms, etc., with their wings expanded, so that such rays of the sun as are available may fall directly on them; they are, however, much more sluggish than in the full sun, the forewings drawn partly back and not opened in the alert way they usually are when the sun is hot. On such a day (September 15th, 1907), the ♀s were observed at Cuxton feeding on the thyme flowers, but they were very shy, bundling off rapidly for ten or twelve yards when disturbed, and usually falling on a patch of bare earth, where they remained well hidden, the ground colour of the underside of the specimens found on the chalk-downs here being generally plentifully mixed with white. In bright sunny weather, one observes that the ♀ *A. coridon* flies very differently from the ♂. At Preda we often noticed her on the flowers like the ♂, but, when on business intent, she flutters slowly through the herbage with short jerky movements, keeping low down, and often stopping and inspecting the plants as she passes them; when thus engaged she walks over the leaves of the foodplant and other herbage

near, as well as bits of stick, etc., carefully inspecting them, and often staying to feel with the ovipositor as if she were about to lay an egg, but goes on again as before; indeed, her selection of a proper place for an egg is most carefully made, and appears to be a matter of the greatest solicitude. The egg-laying seems to be done chiefly an hour or two before and after noon, after which the ♀s are usually to be seen busily feeding on flowers. Although the butterflies soon disappear in continued dull weather, they fly freely enough in the gleams of sunshine in stormy weather, indeed, at very high elevations the ability to take advantage of transient gleams of sunshine may be of great advantage to the species. On dull afternoons both sexes may sometimes be seen sitting upright on flowers, their wings thrown over their backs, the forewings well down between the hindwings, and the antennæ projecting at a wide angle in front; sometimes, however, in bright weather, when merely resting and not asleep, they show quite three-fourths of the outer marginal edge of the forewings extending beyond the apex of the hindwings, the antennæ still well protruded in front, but opened out at a rather smaller angle than those of *Plebeius argus* (*aejon*) under similar conditions; at this time the body is held close down to the resting-surface, the abdomen, indeed, touching the latter throughout its length; at rest, *A. coridon* may, therefore, sit in a variety of ways, sometimes, as noted above, sitting upright with its forewings more or less withdrawn in the hindwings, at others hanging down from a flower, with the forewings more or less hidden. It rests, however, quite differently when asleep; it spreads its legs out widely so that the last thoracic segment practically touches the resting-position, the forewings so far withdrawn between the hindwings that only the extreme tips of the former are exposed, whilst the middle part of the costa of the latter projects as a slight curve or arch beyond the middle of the costa of the forewings; the inner margins of the fore- and hindwings in a straight line, and apparently enveloping the body; the antennæ held widely apart, at least at an angle of 60°. We were much interested on the very dull afternoon of August 17th, 1907, near Preda, at the sight of a ♂ *A. coridon* and a ♂ *Polyommatus eros*, both resting on the same head of knapweed; the latter was bent over, as is its habit in cloudy and wet weather, and, whilst the *coridon* was seated beneath the bent or arched part of the peduncle, head downwards, the *eros* had taken up a position beneath the flower, also hanging head downwards, the former acting as a roof and protecting it from rain. Lucas particularly notes (*Ent.*, xxxiv., p. 228) how well-protected *A. coridon* appears to be when resting on the flowerhead of a small plantain (*Plantago media*). When waking, the ♂ *A. coridon* first raises and lowers its wings alternately, then raises its forewings so that the discoidal spot beneath becomes visible; it then commences to walk in stately fashion, often stopping to paw, as it were, the air with its front pair of legs. When brought from a dark to a light position during the day, *A. coridon*, like *A. thetis*, opens its wings as soon as a bright light falls on it. It would seem that *A. coridon* will rest on almost anything, e.g., in the Via Mala, on August 20th, 1907, consecutive examples were observed on flowers of *Eupatorium*, thyme, clover, scabious, *Hieracium*, and *Saxifraga azoides*, feeding equally eagerly on the flowers of all. One ♀ was observed moving its hindwings alternately; another ♀ only moved slightly its right hindwing up and

down, apparently each time it sucked a fresh draught of nectar from the florets of a knapweed flower. A ♀ that was resting on a flower of *Eupatorium cannabinum*, sat with its wings open at an angle of about 90°, so that the sun shone fully on them, whilst at the same time another that was feeding, kept its wings immovably closed back to back. Another ♀ that was sunning on a *Petasites* flower, threw its wings open to the sun, its head upwards, the abdomen low down, the hindwings drawn back forming a groove into which the body fitted, the forewings well forward, leaving a wide angle between the fore- and hindwings, all of which were almost horizontal; it occasionally drew up its hindwings, and alternately moved them to and fro, but soon subsided into its previous position. Both sexes of the species appear equally to love flowers, and almost every flower with nectar attracts them. It is noted as swarming in August, 1896, along the base of the downs east from Devizes, every flower of thistle and centaury with two or three occupants (Sladen); specially attracted by wild thyme and rock cistus at Watlington (Lucas); ♀ observed feeding on a clematis-flower at Dorking (Prideaux); and a ♂ at privet-blossom near Hounslow (Rendall); the flowers of thyme and knapweed are the most attractive on the Cuxton downs, but sainfoin and knapweed on the Dover cliffs (Tutt). On the continent it has been observed at a variety of flowers, but thyme is an universal favourite. It swarms, however, on sainfoin flowers at St. Michel de Maurienne, on lucerne at Chavoire and Grésy-sur-Aix, on flowers of thistles, scabious, centaurea, and eupatorium, etc., at Digne, in August, 1906, when this species and *A. thetis* were both abundant at the same time, occupying the same ground, feeding at the same flowers, the ♂s fighting with the larger species—*Hipparchia arethusa*, *Erebia neoridas*, etc.—for a place at the blossoms; at Clelles, a few days earlier, it was noticed to be most attracted to the flower-heads of *Eupatorium* and scabious, the latter being easily first favourite; and it was noted that when a ♂ was seated on a capitulum of scabious, it worked itself round and round the edge in order to get at the nectar, so that sometimes its head, and at other times its side or back received the direct rays of the sun; it was also observed to settle on the blossoms of a small *Lotus*, as well as on the flowers of clematis, bramble, and galium. At Lavin and Sus, both sexes chose preferably the flower-heads of a large white umbellifer, whilst, in the Dauphiny Alps, lavender is often chosen, although thyme, as is the case in almost all districts where it grows, is as often selected as any other. Favre notes it as abounding sometimes in Switzerland on flowers of thyme, and we have seen it attracted by the fine southern species of lavender, with its comparatively large flowers at Hyères. We were much interested to note that, when the sun came out in the late afternoon of August 7th, 1907, after a very rainy morning, a crowd of butterflies sat with horizontally-expanded wings on the flowers of a roadside bank near Piotta—*Parnassius apollo*, *Aporia crataegi*, *Dryas paphia*, *Melitaea didyma*, *Brenthis amathusia*, *Heodes virgaureae*, etc.—whilst *Agriades coridon* and *Lycaena arion* sat quite differently, holding their wings bolt upright, the forewings thrown well forward, and hence looking very conspicuous. In the hot sun, especially when rain has fallen the previous day or night, the ♂s will congregate in large numbers at puddles and runnels of water; sometimes, too, on the hot baked sediment by the sides of, or in the

beds of, streams. We have seen as many as a hundred *A. coridon*, with dozens of *Hirsutina damon*, etc., in the space of less than two feet square near Bourg St. Maurice, where the Isère flows beneath the bridge, and the overflow water finds various outlets at some yards distance from the main stream. Near Courmayeur, Bourg d'Arud, and other places, we have seen them in equal numbers, but never a ♀ among them all. At such times they are often very quarrelsome, pushing and jostling not only other individuals of their own species, but also large butterflies of other species, edging them slowly over to the very margin of the damp patch, when they will return to the middle of the area, prepared to jostle off any other insect that comes in the way, or interferes in any way whatever with their evident enjoyment. It is exceedingly abundant by the roadsides and on the banks between Haudères and Arolla, swarming at the trickles running over the pathway, with *Hirsutina damon*, *Polyommatus hylas*, *Aricia donzelii*, *A. astrarche*, etc.; and is also very abundant between Saas-Grund and Hüteck at the runnels crossing the pathway, with *Polyommatus icarus*, *Plebeius argyrognomon*, *Aricia donzelii*, *A. astrarche*, etc. On August 8th, 1907, on a hot day after two days' continuous rain, every tiny rill on the pathway between Brugnasco and Piora, attracted dozens of *A. coridon* and other species, but it was on the damp spots on the path round Lake Ritom itself that the "blues" were most abundant; here, thousands of *Plebeius argyrognomon*, *Polyommatus eros*, *Agriades coridon*, *Cupido minimus*, etc., with *Argynnis niobe*, and several species of *Erebia*, helped to form a living mass of beauty at every few yards distance, and there must have been some millions of insects at the puddles on the steaming pathway round the lake that noon. *A. coridon* was especially prominent in these congeries, which, almost motionless for several minutes, were suddenly seen to be seething with excitement as a few *A. coridon* were seen to be pushing back sideways the insects that crowded upon them, and which at last edged to the outskirts of the company, suddenly flew or ran into the centre again, leaving the greater number of the *A. coridon* on the outside. Similar masses, but in this case made up almost entirely of *A. coridon*, are to be seen almost any hot day in July and August on the edges of the streams and torrents that flow down the mountain valleys, wherever they splash or trickle over, and form shallow pools by the side of the main stream. We have already noted their abundance under these conditions at Bourg St. Maurice; at Clelles, in early August, 1906, they swarmed on the damp sand patches in the torrent bed directly under the railway viaduct a mile or so below Clelles; whilst similarly, above Pré St. Didier, this species may be seen in hundreds bathing in the hot damp sand by the edge of the Dora with *Hirsutina damon*, *Polyommatus icarus*, *Plebeius argyrognomon*, *Aricia astrarche*, etc. Hundreds were to be seen at the roadside pools or by the side of the stream in the Vénéon Valley between Bourg d'Oisans and Bourg d'Arud, in August, 1896, with *A. thetis*, *Hirsutina damon*, *Aricia astrarche*, etc., whilst, on a piece of waste ground above St. Michel de Maurienne, this insect, with *H. damon*, sits in countless myriads along the sides of the runlets that trickle here, there, and everywhere; it is equally abundant at the little rivulets that cross the path all the way up the Pellice Valley, from Bobbie to Au Pra; whilst at Abriès, in August, 1899, this species, with *Hirsutina damon*, *Aricia*

*astrarche*, *Polyommatus hylas*, *P. escheri*, *P. eros*, and *Plebeius argyrognomon*, together with *Adopaea lineola*, rose in clouds from the puddles and runnels when disturbed; there must have often been at least 300 to 400 examples of these species alone in a single little congeries. Mrs. Nicholl reports that *A. coridon* occurred with *Glaucopsyche iolas*, *Polyommatus amandus*, and other species, covering every damp place on the path that ran up the sides of the Baba Planina, a limestone mountain about 16 miles south-east of Gačko in Bosnia. It is often also attracted to less cleanly fluids, for, in August, 1899, it was observed settling on the surface of a pool draining from a manure heap above the village of Simplon, and seemed to have difficulty in rising from the surface again, a reason, perhaps, that accounted for the fact that many examples (together with many moths) were lying drowned on the surface. We have also frequently observed it attracted to the excrement of horses and mules in the roadway, e.g., at Clelles, Chavoire, Evolène, and many other places. Oberthür makes the same observation with regard to this species, in the Hautes-Pyrénées. Both Carrington and Jenner-Weir note (*Proc. Sth. Lond. Ent. Soc.*, 1890, p. 46) the frequency with which the species has been observed to alight on sheep's droppings, and Barraud states (*in litt.*) that, in August, 1901, he noticed three separate cases of ♂s congregating on sheep's droppings, and with one stroke of the net captured more than two dozen specimens. Prideaux records that, in 1895, the bulk of the ♂s of *A. coridon* appeared before the ♀s in the Isle of Wight, and that the former had begun to be scarce by the time that the latter were well out, so much so, that, on August 8th, every ♂ seen in a certain locality near Carisbrooke, was paired with a ♀. Spiller made a similar observation near Chinnor, in 1891. The ♀s appeared to greatly outnumber the ♂s also during the first fortnight of September, 1907, at Cuxton. At the end of the afternoon this species, like *A. thetis* and *P. icarus*, is to be seen settling high up on grass heads, the stems or capitula of knapweed, and other tall herbage, in a spot usually sheltered from the wind, very often in considerable numbers. Generally they rest head downwards, and are fairly conspicuous until their forewings are drawn right down between the hindwings, but, by this time, many have got farther down among the sheltering herbage, whilst, in very rough weather, the greater number get quite down on the ground among the roots and beneath stems, where they are much better protected. Borgmann observes that, on one evening excursion, on the Lindenberg, near Cassel, he saw the butterfly in hundreds, both sexes, sitting on the stalks of wheat. As to the irregularity of the species in abundance, it may be noted that 1887, 1889, 1891, 1899, were years of great abundance in southern England, yet, in 1890, scarcely an example was seen in the localities where in 1889 and 1891 the species almost swarmed. So abundant was the species in 1899, at Eastbourne, that Adkin reports (*Proc. Sth. Lond. Ent. Soc.*, 1899, p. 46) that, as he walked through the long grass that grows so thickly in the little hollows under the downs, after the sun had sunk below the hills, examples of this species and *Polyommatus icarus* rose in quite bewildering clouds. Prideaux observes (*in litt.*) that, on August 19th, 1905, a redstart was observed successfully sweeping up specimens of this species on Bowcombe Down, Isle of Wight. Colthrup records (*Countryside*, 1908, p. 267) that he observed imagines of this species when at rest on grass stems at Beachy Head on August 16th, 1907, attacked by a pair of furze-chats. He further



adds (*op. cit.*) that, in both 1906 and 1907, he watched a kestrel feeding on the same species; it hovered just over the grass-stems and picked them off one after the other while at rest. It is rare that this species overlaps to any extent the first brood of *A. thetis* in Britain, for, although the latter usually continues into July [see *antea*, vol. iii. (x.), p. 378], yet it is very unusual to see the two species together when *A. coridon* is just commencing to appear; on the other hand, it is a very common thing to see the late *A. coridon* on the wing with the early *A. thetis* of the second brood, in fact, for both to be waning together, and thus bearing testimony to the laggard manner in which *A. coridon* supports its single brood, *e.g.*, Sabine notes both species flying together at Folkestone, September 4th-7th, 1886. Adkin notes (*Proc. Sth. Lond. Ent. Soc.*, 1887, pp. 83-84) that, from August 1st-28th, 1887, it was very abundant on the downs near Eastbourne, some on the latter date were quite fresh; on August 28th, the first *A. thetis* (two ♂s) were seen, on September 16th both species were still out commonly, some of the *A. coridon* yet quite fresh, and some of the *A. thetis* worn; the species were, during this time, flying freely together and resting on the same flowers. Similarly, in 1891 (*op. cit.*, 1891, pp. 169-170), *A. coridon* was abundant on August 1st at Eastbourne, and continued to be so until September 3rd; *A. thetis* first appeared on August 22nd, and was on the wing from then till September 3rd with *A. coridon*, when observation ceased. The two species are not always abundant in the same years, indeed, in certain abundant years for the one the other may be almost absent, *e.g.*, Stonestreet notes (*Ent. Wkly. Int.*, x., p. 186) that, in 1861, *A. coridon* was very abundant, whilst *Agriades thetis* and *Melitaea cinxia* failed almost entirely in the Dover district.

**HABITATS.**—As far back as 1798, Donovan noted this species as being found “on the chalk-hills between Dartford and Rochester, particularly on a long range of hillocks leading from Dartford to the wood of Darenth,” hence the butterfly has been called “the chalk-hill blue.” This is almost our own homeland, and thoughts of *Agriades coridon* immediately raise in our mind the lovely stretch of chalk downs running along both sides of the Medway above Rochester, the similar stretches in the Isle of Wight behind Sandown and above Freshwater Bay, the steep rocky chalk precipices looking out over the Straits between Dover and St. Margaret’s Bay, the breezy stretches rolling back from Beachy Head, and many other of the choicest wild spots still left in the southern counties of England. The species haunts almost exactly the same kind of place as *Agriades thetis*, and appears, like that species, to be confined to districts where *Hippocrepis comosa* grows, but it reaches into Lincolnshire, Northampton, and Worcestershire, all north of the known habitats of *A. thetis* in Britain, whilst there are records from the more northern counties of Lancashire, Cumberland, and Westmorland, some of which are now held to be not altogether free from suspicion by those who are most interested in the fauna of these counties. There seem to be few suitable spots on the North and South Downs that the species does not occupy, though its absence from other apparently suitable spots sometimes seems hard to explain, and Oldaker notes it (*in litt.*) as common only in one particular field on the Rammore slope, this being about a quarter of a mile distant from the field in which *A. thetis* is abundant; it occurs similarly on the limestone and chalk-hills of Dorset, and the oolitic limestone of the west, but is by no means absolutely confined to chalk and limestone

localities. We have taken it in the main "drive" of Chattenden Woods, on tertiary deposits, resting, however, on chalk; it is recorded as being common among heather at Groombridge and on Broadwater Common, neither place on the chalk (Blaber); it is reported (*Vict. C. Hist.*) as having been caught several times in Cornwall, although there is no chalk in the county, occurring on railway-banks at Terras (Clogg); it is also noted as common at Broxbourne Common, Turnford, and St. Albans in Herts, all a considerable distance from the chalk; it occurs at Portland, where again there is no chalk (Partridge); and in the Wootton-under-Edge district, miles from any chalk (Thompson). Abroad, it occurs among dark trap rocks at Aussig in Bohemia (Weir); and on the Taunus Hills, not on chalk (Prideaux); whilst Chapman (*Proc. Sth. Lond. Ent. Soc.*, 1906, p. 60) states that it occurs at Ste. Maxime, where there is neither chalk nor limestone. Our knowledge of the geology of so many of the localities in which we have collected abroad is too uncertain to allow us to make definite statements, but we believe that it often occurs freely off limestone in many places. Of the many localities recorded for the species in England, we note that it occurs on some of the open dry hillsides of the Cotswolds (C. J. Watkins), on a sea-bank about two miles west of Beer Head, where *Leptidia sinapis*, *Thymelicus acteon*, *Agriades thetis*, *Ruralis betulae*, and other interesting species occur (Blathwayt), abundant in the chalkpits near Cambridge (Lee), and on the chalk-hills near Bedford (Barrett), abundant, the imagines seen settling in the cornfields to the north of the chalk range in Purbeck, though not seen on the south side (Parmiter), swarms on the chalk downs extending east from Devizes (Sladen), chiefly confined to the open paths of the woods at Watlington (Lucas), on the waste ground around Carisbrooke, etc. (Prideaux), on the downs in the neighbourhood of Kimble (Rowland-Brown). Keynes published (*Ent. Record*, xxi., p. 263) a most interesting note on the habitats of this species in Cambridgeshire and the neighbouring district, where it is confined to the uncultivated parts of the low chalk-hills between Cambridge and Baldock in Herts. The species has certain fluctuations in its abundance and rarity, and, in some years, it not only abounds in its own home localities, but attempts to spread its range into comparatively little suited districts, entering even into suburban London at some distance from its known nearest haunts; such a record is that of its occurrence in Ladbroke Square, Notting Hill, in August, 1864 (A. H. Clarke), then a much more suburban district than at present; singly on the railway-bank at Brockley (W. West), etc. Walker notes (*in litt.*) that, in 1903, he took, at Watcombe, near Torquay, an example in June on the Red Sandstone, no chalk or limestone being near, and heard of another being captured there; similarly, in 1874, two specimens were taken in the Orchard Woods near Taunton, where there is no chalk within 15 or 20 miles (*teste* Stansell, *Ent.*, viii., p. 158), and a specimen was taken recently on the Quantocks, many miles from the nearest chalk (Tetley). Rait-Smith observes (*in litt.*) that, on August 26th, 1905, at Abertillery, he took a ♂ in good condition in a marshy meadow, where, however, further search has not provided a specimen; similarly, Bishop records the capture of a specimen in a swampy spot covered with rushes at Loughton, on July 29th, 1885, a later one being captured on August 22nd, 1892, at Fair Mead, by Argent. As to its taking possession of new territory,



Zeller reports (*Ent. Mo. Mag.*, vi., p. 11) how, during the first year of his residence at Meseritz, he saw no *A. coridon*, and only a few plants of *Coronilla varia*, but, as the northern roadway became older, the plant became more frequent, and, in 1868, he, for the first time, saw a few *A. coridon*, which, no doubt, had followed the spread of the foodplant. Thoughts of its habitats on the continent call to mind some of the most delightful spots in Europe—the blue waters of the Mediterranean Sea as at Hyères, Ste. Maxime, etc.; the wide upland tableland of Iberia; magnificent forests like that of Fontainebleau; sparkling streams like those of the Trafoi-bach, the Saas and Visp, the Arolla, the Ticino, the Pellice, and the Dora; mighty glaciers and snow-clad peaks as at Chamonix, Arolla, Zermatt, and the Rosegthal; the highest passes, as the Col du Galibier, the Stelvio, etc.; gloomy gorges like the Via Mala; rocky pinnacles at Cortina di Ampezzo, the Mendelstrasse, and the Eggenthal; sun-baked wastes as at Botzen and Digne; beautiful lakes as on the Grésy Hills, Chavoire, the Lac d'Allos, Bregenz, Stresa, Bellagio, etc., for the species occurs from the sea-level to far above the forest zone, on the topmost alpine pastures, indeed, one's mind travels over almost all the choice wild places that millions travel thousands of miles merely to see. How one recalls them all—the flowery slopes near Gex, where *A. coridon* abounds with *Aricia astrarche*, *Melitaea parthenie*, *Enodia dryas*, *Erebia aethiops*, and many other species in July; the tangled thicket at the foot of the Grand Salève, beyond Veyrier, where, among the long grass and tall flowers of the bushy slope, at the foot of the woods, this species abounds with a host of other interesting species; in the fields, and on the waste places among the vineyards, at the foot of the Grésy hills, flying with *Polyommatus icarus*, *P. hylas*, *Aricia astrarche*, *Agriades thetis*, etc., as well as on the well-known strip by the poplar trees near the top of the hills, where assemble hosts of almost every species that haunts the neighbourhood, and almost as abundant on the slopes of Chavoire just above the waters of the beautiful Lac d'Annécý; swarming at Digne in early August, especially in the weedy fields beyond the Baths, where an abundance of blossoming flowers attracts also *Agriades thetis*, *Polyommatus meleager*, *P. hylas*, *P. icarus*, *Melitaea deione*, *M. cinxia*, *Epinephele lycaon*, *Hipparchia arethusa*, *Erebia neoridas*, etc., whilst it also collects in little flocks on the black mud of the bed of the Eaux-Chaudes, where *Plebeius argyrognomon*, *Polyommatus icarus*, *Aricia astrarche*, and *Scolitantides baton* are its chief supporters. It was very abundant also in a flowery meadow some distance above Allos, on the road to the Lac d'Allos, where it occurred with *Polyommatus icarus*, *Loweia gordius*, *Alugia spini*, *Melitaea didyma*, *Melanargia galathea*, *Gonepteryx rhamni*, *Colias edusa*, *C. hyale*, etc., as well as at a place considerably higher, where a spring of clearest water, surrounded by tall flowering heads of catmint, was most attractive to this species as well as to *Polyommatus eros*, *Plebeius argyrognomon*, *Heodes virgaureae*, *Coenonympha iphis*, etc., whilst, on the long heath-like moorland slopes, still farther up towards the lake, it was again exceedingly abundant, accompanied by *Hirsutina damon*, *Cupido sebrus*, *Aricia astrarche*, *Cyaniris semiargus*, *Polyommatus eros*, and *Plebeius argyrognomon*, appearing again on the very margin of the Lac d'Allos itself. Similarly above Larche, it occurred on all the slopes around to a height of 6000ft.-7000ft., whilst above Abriès it reaches quite as high

an elevation, being particularly abundant in the openings of the larch forests, leading up to the Pointe de la Lauze, with *Polyommatus hylas*, *Hirsutina damon*, *Cyaniris semiargus*, *Cupido minimus*, *Aricia astrarche*, *Heodes virgaureae*, etc., and extending far up towards the summit in the region of *Parnassius delius* and *Erebia glacialis*, leaving most of its congeners at the lower elevations. Similarly, it is as abundant all around le Lautaret, leading up to the Col du Galibier, and swarms throughout the whole length of the Vénéon and Romanche valleys. How different are these habitats again from its haunts on the cistus-covered slopes of the Pont du Gard, the waste ground on the outskirts of the wood that clothes the arbutus-clad hollows at the back of the Castle hill at Hyères, where it flies with *Melitaea cinxia*, *M. phoebe*, etc.; the lovely woodland dingles near Draguignan, whilst at Ste. Maxime, apparently one of the earliest spots for the species in Europe, it occurs in April in a thick pinewood, with no limestone near, and in what one might suppose was a most unlikely-looking place for the species. Oberthür says (*Etudes*, xx., pp. 21-22) that, in early August, *A. coridon* is extraordinarily abundant in the Hautes-Pyrénées, and, on warm days, one sees large numbers on the road, resting or flying in places where the torrents have wetted them. The species is also fond of the excrement of horses and mules, and the large numbers that may be seen on a single day on the road from Luz to Gèdre often passes imagination. Taslé observes (*Ann. Ent. Soc. Fr.*, 1908, p. 689) that "it is worthy of note that, in Morbihan, *A. coridon*, which is never met with on the wing round Vannes, is found abundantly on a little piece of land situated near Lantillac, between Joscelin and Locminé, where occurs one of these 'Pliocene islets,' of which a long series extends *en echelon* from the extremity of Brittany to the gates of Angers (Maine-et-Loire)." One wonders what the geological formation of these 'Pliocene islets' is, and whether *A. coridon* occurs on all of them, and is confined to them in this district. Constant states that, in Saône-et-Loire, it is common in almost all localities on the chalk, but is absolutely wanting on other formations. In Switzerland, it is reported as very abundant everywhere, and certainly it seems to be so in almost all the districts in which we have collected, except the bogs above the Lake of Zürich, where it is apparently a scarce wanderer from the surrounding districts. It reaches from the lowlands to at least 8000ft. elevation, where suitable spots are to be found. It is difficult to select characteristic habitats, but between Vevey and Aigle it was the most abundant "blue," exceedingly common on a steep rocky slope near Roche, where *Polyommatus icarus* and *Cyaniris semiargus* were also abundant, and *Satyrus cordula*, *Hipparchia alcyone*, *Melitaea didyma*, and many other species abounded. It occurs in the clearings among the larches by the side of the path leading from the Col de la Forclaz to the Glacier du Trient with *Heodes virgaureae*, *Melitaea dictynna*, etc. The Val d'Hérens may be taken as typical of any of the lateral valleys of the Rhone, the insect occurring from the tangled mass of flowers at the foot of the ascent just outside Sion, on the slopes between this and Vex, in the meadows about Vex and Useigne, on the borders of the woods that reach down to the road between there and Evolène, then again on the upland slopes between Haudères and Arolla, until at last it is found equally abundant on the high alpine pastures leading from Arolla almost to the summits of the surrounding mountains. It occurs abundantly around the last pine-

woods opposite the Mont Collon glacier, and beyond again, up the slopes towards the Aiguilles Rouges, where *Polyommatus hylas*, *Laticorina orbitulus*, *Albulina pheretes*, *Aricia astrarche*, and *Cupido minimus* keep it company, as well as the more purely alpine species. This is equally true of the Visp and Saas valleys in the whole ascent from Visp to the Gorner Grat, or from Visp to the Mattmark Lake or to Saas-Fée. Similarly it abounds all over the Reuss valley from Oberalp and Hospenthal to the level of Lake Lucerne; it occurs equally abundantly in the Upper Engadine from Maloja to Pontresina and thence to the foot of the Roseg glacier and to the summit of the Bernina. It is equally abundant in the Lower Engadine on the roadside between Sus and Lavin with *Hirsutina damon* and *Aricia astrarche*, as well as on the slopes above Lavin; it also occurs commonly between Sus and Zernetz, as well as above Zernetz over the Ofen Pass and into the Münsterthal, less abundantly, however, than in the Sus, Lavin, and Pontresina districts. It abounds throughout the Albula Valley, and is very common on the flowery banks between the lovely Lake Palpuogna and the Weissenstein Inn on the Albula Pass. On the southern slopes of the Alps it is equally abundant, it swarms almost everywhere between Airolo and Piora, occurring in thousands round the sides of Lake Ritom with *Plebeius argyrogonomon*, *Polyommatus eros*, etc., whilst a roadside bank near Piotta, leading down to a flat through which the Ticino flowed, the flat filled at one end with a dense alder carr on the borders of which *Eupatorium* and other flowers, loved of insects, abounded, swarmed with butterflies in early August, 1907, amongst which *A. coridon* flew amid hosts of *Aricia astrarche*, *Plebeius argus*, *Polyommatus icarus*, *P. hylas*, *Cyaniris semiargus*, and numbers of other species. On the Alpe Pianascio, above Fusio, it occurs with *Polyommatus eros*, *Brenthis pales*, *Melampias epiphron*, *Erebia tyndarus*, and other purely alpine species. As suggesting an entirely different habitat one may note the tangled edge of the Weesen Marsh, where the river leaves the lake on the way to Zürich, and where a part of the marsh has become comparatively dry and covered with bushes and a really extensive butterfly fauna dwells, and where one finds *A. coridon* abundantly with a large number of other interesting species. In Vorarlberg and Tyrol, the habitats are very similar to those just described; it abounds on the wooded slopes of the Pfänder, behind Bregenz, whence one obtains a most lovely view of Lake Constance; it is equally common on almost all the ground between St. Anton and the summit of the Arlberg, whilst on the Postenalp, above Brenner, it occurs with many purely alpine species, on the edges of the firwoods as well as on the higher slopes. On the Mendel Pass it is very abundant, swarming on almost every flower, fighting with such species as *Dryas paphia*, *Argynnis aglaia*, *Melanargia galathea*, *Epinephele ianira*, *E. lycaon*, and others equally abundant for a place, whilst, at the little "quelle" on the Mendelstrasse, the imagines hustle the *Libythea celtis* and *Erebia aethiops* that sit still absorbing the fluid, until they are made to shift their ground to a quieter spot where they are able to settle down again. It is equally abundant in the porphyry mountains that guard the Eggenthal and the Sarntal, in the latter quarrelling on the slopes, well up towards Sarnthein, with *Erebia nerine*, that hangs in velvety blackness on the flowers, *Polyommatus meleager*, *Dryas paphia*, and other local species. One of its most interesting habitats is the upper

portion of the Trafoithal; here, on the alpine pastures, on a level with the glaciers of the mighty Ortler, are stretches of wild flowers at an elevation of 7500ft. to 9000ft., and, on these slopes, with *Erebia glacialis*, *E. gorge*, and other of the highest alpine species, *Agriades coridon* holds court, not in the same abundance above Franzenshöhe as below it, but still going up as far as its foodplant reaches. It occurs equally abundantly in all the alpine meadows in the Dolomites between Cortina di Ampezzo and the summit of the Falzarego Pass, as well as between Cortina and the Misurina Lake and Schluderbach, on the slopes of Monte Cristallo, the Sorapiss, the Croda da Lago, etc. In Bohemia it is reported as occurring in flowery meadows (Nickerl); in the meadows on the southern slopes of the Nockstein at Salzburg, as well as on the plain (Fritsch); in Upper Austria, in mountain meadows reaching into the high alps (Brittinger); in Lower Austria, also in the mountains and plains, occurring almost everywhere (Rossi); in Salzburg, on warm dry slopes on chalk, up to the tree limit, in some places in great abundance (Richter). It is noted as being very local in Carinthia (Höfner), and in Carniola is said to occur pretty commonly on dry sandy slopes (Hafner). In Bosnia, it occurs between Focha and Celebic, where forests alternate with mountain meadows brilliant with flowers, and where it is found in company with *Lycaena arcas*, *L. arion*, *Polyommatus meleager*, *Agriades thetis* (*bellargus*), *Chrysophanus hippothoe*, *Heodes virgaureae*, etc.; it also occurs between Serajevo and Gorazda, with swarms of *Dryas paphia*, *Argynnis adippe*, *Apatura iris*, *A. ilia*, and many other interesting species; whilst Aigner-Abafi says (*in litt.*) that, in Hungary, it is plentiful on the mountains and the meadows of the plains. In Roumania it is both local and rare, and only occurs on the Muschelkalk hills on the Bucovina frontier. In Germany the species has similar habitats to those of *A. thetis*; it is decidedly a chalk-loving insect, and is to be found on the dry sunny slopes of the chalk-hills, in some places in very great abundance; in the Alps it extends up to the tree limit (Speyer). It is reported as occurring everywhere in Westphalia on chalky soil, wherever its foodplants grow, and is common on sunny mountain sides and stony slopes, but prefers fields of *Onobrychis sativa* (Uffeln). In the Rhine Provinces it occurs also on chalk, on the Budberg and Mündelheim embankments and the adjacent meadows (Rothke); in Hesse, it is local, though abundant on the marsh near Mombach (Koch), and in the Mombach Forest (Glaser); it occurs on the chalk outcrops in the tertiary basin of Mainz, and, whilst abundant at Biebrich, is almost wanting in the Taunus (Rössler); in Thuringia it occurs both on sandy and chalk soils in the plain, and is common in the foothills of the higher regions (Krieghoff); in the Province of Saxony it is common on the chalk hills at Gera, as well as in the Stiegerwald and Willroda forest in open grassy places, whilst near Zeitz it particularly affects flowery slopes and fields of *Onobrychis sativa* (Wilde); in Anhalt, it is chiefly found in meadows (Amelang); in Waldeck it haunts the same habitats as *A. thetis*, chiefly on chalk soil, and is in some years exceedingly abundant (Speyer); in Brandenburg also it affects the chalk-hills (Bartel and Herz); whilst, in Silesia, dry meadows, forests, and the outskirts of forests, are noted as its haunts (Döring); it is recorded as occurring on sandy soil in the plains, and on chalk in the foothills of the mountains (Wocke); in the Kingdom of Saxony it is locally

abundant ; it loves sunny, rocky slopes, especially on a calcareous soil, and collects in dozens at wet places in the roads (Steinert); it occurs everywhere throughout Bavaria, is the most common "blue" about Munich (Kranz), and is often found around puddles in great numbers in the Bavarian alps (Kolb); it is also to be seen throughout Württemberg in sunny places, wherever the foodplant grows (Keller and Hoffmann); in Baden, it is especially distributed on the chalk and loess mountains, occurring around the sources of the Danube (Reutti), and on the mountains round Carlsruhe only on chalk, although it is found abundantly on sandy soil at Maxau (Gauckler). We know nothing of the Russian habitats, except that Eversmann says it is not rare in grassy places in the foothills of the Urals, and in fields in the Province of Orenburg. In northern Italy, the localities are so like those of Switzerland and the mountains of France, that it is almost useless to repeat them, and there is hardly a wayside bank with flowers or a runnel across the path between Aosta and the topmost points of the Val Vénì or the Col Ferret, where the species is not to be found; similarly throughout the whole of the Val Tournanche from Châtillon to Breuil, and the Val Anzasca from Piedimulera to the pastures on Monte Rosa, above Macugnaga; it is equally distributed throughout the Pellice valley from Torre Pellice to the Col de la Croix, and in all the openings of the lovely walnut and chestnut forests as one climbs the road to Monte Viso past Crissolo, but in all these localities the insect is rarely seen till the end of June, and usually only in July and August. This makes one doubt Verity's sweeping assertion (*in litt.*) that, all over Italy, *A. coridon* is one of the most plentiful of butterflies, flying on the sun-burnt hills all the year except June, July, and December, January and February. It is just from such apparent over-statements of fact as this, that one wants to sift the truth, and we observe (*Bull. Ent. Soc. Ital.*, 1904, p. 139) that Verity records the species as "very rare everywhere in September on the Lucca coast, but occurring rather frequently in the pinewood where *A. thetis* was flying so abundantly, the specimens notable for their large size and the intensity of the underside spotting" (which makes one wonder whether the Rivieran form extends here). The habitats of this species in Spain, where its variation is so interesting and extreme, have been described by few collectors; Mrs. Nicholl notes that the white var. *albicans* flies in the scorchingly hot dry water-courses of the southern slopes of the Sierra Nevada, where the specimens were scarcely distinguishable from the white rock they haunted. Chapman observes that at Cuenca the *aragonensis* form occurred on limestone, and that it was also found commonly on the well-known *Satyrus priouri* ground at Albarracin; this is a dry river-bed reaching up to a stony undulating region, in which the limestone rocks are very close to the surface, and which grows savin trees, *Ephedra nebrodensis*, many spiny papilionaceous shrubs, etc., and where the Satyrids—*Satyrus ndia*, *S. statilius*, *S. semele*, *S. alycone*, *S. briseis*, *S. actaea*, *S. circe*, etc., are abundant. The violet-coloured *hispana* did not occur on limestone, but was abundant at Tragacete, Puerto de la Losillo, and Bronchales; at Albarracin it overlapped *aragonensis*, though it did not occur on the same ground. Sheldon also found the latter commonly at Albarracin, with only a single *hispana*, between July 27th and August 5th, 1895, but he found the latter form common at Noguera on August 7th, in a

large and wide valley, covered with cistus, and in the flowery openings on the outskirts of the pinewood beyond; here they literally swarmed, and one could catch half-a-dozen with a sweep of the net; this form is different from the type in flight, and appears very near *A. thetis* in colour, when on the wing. Chapman further notes that, in July, 1902, he found sparingly, at Avila, on outcrops of limestone, a form very near the *aragonensis* taken the preceding year at Cuenca and Albarracin. In 1903, Chapman found the *aragonensis* form again on the low dry limestone hills between the Santuario de Moncayo and Agreda, the hills covered with sparse aromatic herbage much like that of Cuenca and Albarracin; the fauna generally is also like that of the latter district, for, besides the similar form of *A. coridon* just mentioned, *P. hylas* var. *nivescens*, *Argynnis adippe* var. *chlorodippe*, etc., also occurred there.

**BRITISH LOCALITIES.**—The British range of this species is not too clearly defined, but it does not occur in Scotland or Ireland. In England, whilst locally common in some counties it is rare or absent in the west, in Wales, and in all the English counties north of Norfolk, Northampton, Cambridge, and Worcester.—**BEDFORDSHIRE**: Barton Springs (Ashleigh), near Bedford (Barrett), Barton Hills, common (Gifford-Nash), Whipsnade, near Dunstable (Mathew). **BERKS**: common and general on the chalk, frequently in great abundance (V.C.H.), locally abundant in the Marlow district (A. H. Clarke), Newbury (Hopson), Bagley Wood (Galpin), near Shotover Hill (Poulton), Reading (Clarke), Burghelere (Alderson), Burghfield, near Reading (Bird), Streatley (Geldart), near Tubney, near Oxford (Hamm). **BUCKS**: locally abundant, Marlow (A. H. Clarke), near Kimble, in the Wendover district (Rowland-Brown), Drayton-Bauchamp (Rothschild), Buckland, Aston-Clinton (Harpur-Crewe), Halton (Greene), High Wycombe (Ulyett). **CAMBRIDGE**: local on the chalk—Newmarket Heath, Devil's Dyke, Fleam Dyke, the Via Devana (Keynes), near Ely (Archer), Gogmagog Hills, near Cambridge (Lee), Cambridge (Crisp), Cherry Hinton (Bond), Hinton chalkpits (Jenyns). **CORNWALL**: near Terras, Pill, etc. (Clogg), Paul, near Penzance, a single specimen (Baily), near Whitsand Bay East (Marryat). [**CUMBERLAND**: Grisedale, at the foot of the Saddleback, Penrith (Hope), see *Ent.*, xxi., p. 54 (Hodgkinson).] **DEVON**: Lundy Island (Tutt coll.), near Beer Head (Blathwayt), Watcombe, near Torquay once (Crocker), Torquay district, once (Walker), between Sidmouth and Charmouth (Riding). **DORSET**: common on the chalk downs in South Dorset (Bogue), locally common in the Isle of Purbeck, Isle of Portland, Wimborne (Banks), Swanage (Bloomfield), Blandford (Thorne), Cranborne (Nelson), Sherborne (Douglas), Lulworth (Luff), Hodd Hill (Fowler), Portland (Partridge), Dorchester, one specimen, Glanville's Wootton (Dale), Gussage St. Michael, abundant (Ward), Lyme Regis (Gatcombe), Weymouth (Bingham), Puddle-Hinton downs (Stephens). **ESSEX**: rare—previous to 1860 occasionally near Colchester, common near Epping in 1859, single specimens taken in 1885 and 1892 (Essex C. List), Havering-atle-Bower, 1899, one, and one at great Horkesley in 1901 (Miss Pemberton Barnes), Saffron Walden (Jeffrey), Fair Mead, Epping Forest, one (Argent), near Colchester (Harwood), Loughton, one (Bishop). **GLAMORGAN**: common at St. Brides' near Bridgend (Evan John). **GLOUCESTER**: throughout on limestone—Stapleton, Durdham and Coombe downs, Bristol (Hudd), Painswick district, Painswick Hill, Stroud (C. J. Watkins), Stroud district (Davis), Clifton, Wotton-under-Edge, Dursley, Cheltenham, Cirencester, Birdlip (Perkins), Prestbury, near Cheltenham (Humphreys and Westwood), Rodborough, common (Musgrave), Forest of Dean (Langley), Leckhampton (Trye). **HANTS**: common on the chalk and Upper Greensand, Pan Down (Moray), Isle of Wight, near Newport (Stephens), Freshwater (Tunaley), Sandown (Tutt), near Carisbrooke Castle (James), Gurnard Bay (Gibson), Ventnor (South), nr. Shanklin (Tutt), St. Boniface Down, Limpet Run, Brading and Bembridge Downs (Poole), Bournemouth (Shipp), Portsdown Hill (Pearce), near Winchester (Dale), once in the New Forest (Corbin), in the Rhinefield Sandys enclosure (Lockyer), Southsea, one on the beach (Moncreaff), Basingstoke, common in a few localities (Hamm). **HEREFORD** (Lea, *Ent.*, xx., p. 265). **HERTS**: Lilley Hoo (Gibbs), Letchworth (Ashleigh), Tring (Barraud), Hitchin (Knapp), New Farm, St. Albans (Lewis), Broxbourne, common (Warner), Aldbury



Downs (Cottam), Dancer's End (Rothschild), Royston Heath (Keynes), Royston Downs (Hardy), one at Turnford (Boyd), Latchmore (Gatward). HUNTS: Huntingdon (Curtis). KENT: Isle of Sheppey, Chatham district (Walker), St. Margaret's Bay, Halling, Chattenden Woods, South Foreland, Cuxton (Tutt), Folkestone (Page), Eynesford (Turner), near Dover (Sloper), Kingsdown (Fenn), Burham, abundant, Darland Hill, abundant (Chaney), Plumstead Marshes (Webb), Wrotham Hill (Andrews), Beckenham (*Ent.*, xx., p. 230), Maidstone district (Goodwin), near Herne Bay (Butler), Shorncliffe (Rogers), Seal Chart (Carrington), between Walmer and St. Margaret's (Hodgson), Longfield, near Gravesend (Jennings), between Dartford and Darenth (Newman), Ashford (Wood), Sevenoaks (Holmes), between Dover and Sandgate (Cox), Canterbury district (Parry), Ramsgate (Wormald), Otford (Battley), Chevening, near Sevenoaks (Stanhope), Shoreham (Bower), Frinsted, near Sittingbourne (Mathew). [LANCASHIRE: Arnside,\* Silverdale (Hodgkinson) (*Ent.*, xi., p. 113), Grange (Owen, "Newman's Brit. Butts.," p. 132) (*teste* Arkle, *Ent.*, xix., p. 242) (F. O. Morris, *Brit. Butts.*), Grange, common on limestone (*teste* Gregson) (*E.W.I.*, vii., p. 54), Whorton Crag (Murray); near Warton, in 1892 (Loxham *teste* Forsythe, *Ent.*, xxxviii., p. 88). LINCOLNSHIRE: common on chalk (Allis). MIDDLESEX: Near Hounslow (Rendall, *Ent.*, 1887, p. 229), Ladbroke Square, Notting Hill, 1864 (A. H. Clarke), near Wembley (Bond), near Enfield, one (Sykes), Old Oak Common (Godwin), Kingsbury (Goodwin), [Pinner Carrington, *Ent.*, xiii., p. 122]—possibly an error. At any rate the ground is now unfortunately to be built over (H. Rowland-Brown); Pinner Drive (Melvill), quoted by Bonhote and Rothschild (*Harrow Butts. and Moths*, p. 12), also requires confirmation. The ground is, however, now almost covered with villas (H. Rowland-Brown)]. MONMOUTH: Gamaren (Langley), Abertillery, one ♂ only (Rait-Smith), Tintern (Bird). NORFOLK: common on the chalk in the district of Norfolk near the Wash (Brameld), Hunstanton (Raynor), Ringstead Downs, abundant, Lynn, Snettisham (C. G. Barrett). NORTHAMPTON: very local on limestone (Rothschild), Peterborough (Stainton), Ailesworth (Heberden), Northampton (Goss). OXFORD: Chinnor (Spiller), Watlington, Enstone (Cruttwell), Nettlebed, common (Geldart), near Reading, Shotover Hill, near Oxford, Horspath (Hamm), Gryme's Dyke (J. C. Dale *teste* Stephens), Wychwood Forest (*E.W.I.*, i., p. 147). RUTLAND: Uppingham (Bell). SOMERSET: scarce—Leigh Woods (Hudd), near Bath (Greer), Weston-super-Mare (Crotch), Quantock Hills, once only between Langport and Taunton (Doidge), Brean Down (Prideaux), Orchard Wood, near Taunton (Stansell), Bridgwater, Frome, Wells, the Mendips, scarce near Bristol (V.C.H.), Clevedon (Mason). SUFFOLK: Needham Market (Baker), Bury St. Edmunds (Norgate), Little Blakenham, Moulton, and Eriswell (Miss Jermyn), local—Newmarket, Dalham, Tuddenham, Felixstowe, Lowestoft (*teste* Bloomfield). SURREY: locally abundant—on the downs from Farnham to Dorking (Champion), Riddlesdown, Caterham, Redhill, Reigate, Clandon (Turner), near Shere (Tremayne), Box Hill, Mickleham Downs (Trimen), near Guildford (Swinton), near Croydon (Harrison), Bagshot, singly (Floersheim), near Godstone Road (Stainton), Haslemere, Milford, near Godalming (Barrett), Beckenham (Reid), Horsley (Bell), West Horsley, Kenley (Carrington), Park Down (T. Bainbrigge Fletcher), Hog's Back, Sheep Leas (Barrett), Purley, Oxted (Sheldon), Caterham (Bower), Ranmore (Oldaker), Barnes Common (Sharp, *Ent.*, xviii., p. 316), Brockley, occasionally on railway embankment (W. West). SUSSEX: abundant on the chalk-hills—everywhere on the South Downs (Newman), Beachy Head (Esam), Ditchling Beacon, Burgess Hill (Dollman), Abbott's Wood, occasionally (Dale), Hastings (Sotheby), Chichester (Ash), Lewes (Turner), Eastbourne (Adkin), the downs near Newhaven (Reeve), Hollingbury Coombe (Image), Brighton (Peskett), between Lewes and Glynde (Gush), near Steyning, Beeching, chalkpits near Shanktonbury Ring (White), Groombridge and Broadwater Commons (Blaber), Polegate Downs (James), near Hailsham (Hamlin), on the downs between Shoreham and Worthing roads (Bird), Hayward's Heath (Jenner), West Sussex—common on the downs (W. H. B.

\* Some writers give "Arnside Knott" as a locality for this species, but I have worked this country for 25 years and have never seen one, and with the exception of J. B. Hodgkinson, I never met anyone that had; I am much inclined to doubt whether he really ever took the insect there at all. It is to be observed that all the records for Lancashire, Westmorland, and Cumberland, in Newman's *British Butterflies*, p. 132, are Hodgkinson's, and as the Arnside locality is a wild and uncultivated country, and at the time I first collected there 25 years ago very little worked entomologically and certainly not over-collected, it seems very strange why it should have disappeared (H. Massey).

Fletcher), Rottingdean (Buxton). WARWICK : once near Knowle, one specimen only (Bree *teste* Humphreys and Westwood), near Wolford (Wheeler). [WESTMORLAND : Rough Fields, near Beetham and Milnthorpe (Hodgkinson, *Newman's Brit. Butts.*, p. 132), Kendal district, not been seen of late years (Moss). Wants confirmation altogether as a Westmorland species.]. WILTS : Old Sarum, plentiful (Stephens), Calne (Eddrup), Amesbury (Pyle), Salisbury Plain, abundant (Manders), near Ramsbury (Rye), Figheldean, near Amesbury (Caswall), Glory Ann, Rainscomb Park, near Gt. Bedwyn (Preston), on the London Road, between Wincanton and Salisbury, near the village of Mere (Tetley), Salisbury, abundant on the Downs (Carr), Devizes, common, Winsley, rare (Sladen). WORCESTER : Hilbury Hill, Worcester (Rea).

DISTRIBUTION.—This species has almost identically the same area of distribution as *Agriades thetis*. Its southerly range appears to be the north shore of the Mediterranean, reaching 35°N. lat. in Syria; its northerly limit appears to be 57°N. lat. in Russia (Viatka Govt.), dropping to 53°N. lat. in Germany and England; its most easterly range appears to be about 50°E. long. (Viatka Govt., Kasan, Orenburg, and Persia); its westerly range appears to be chiefly limited by the Atlantic seaboard. ASIA : Asia Minor—Brussa, Mt. Olympus (Lederer), Armenia (Staudinger), Tokat, Amasia (Fountaine), Kerasdere, Taurus Mts. (Staudinger), Cilicia (Holtz), Caraman (Rühl), Smyrna, Külek (Brit. Mus. coll.), [Persia—Irak district (Young). Wants confirmation.], Syria—Lebanon and Antilebanon, Hasbeyah (Nicholl), between Bsherreh and the Cedars of Lebanon (Fountaine), Shar Deresy (Brit. Mus. coll.). ANDORRA : between the French frontier and les Escaldas, common (Rowland-Brown). AUSTRIA : locally abundant. Bohemia—Aussig (Jenner-Weir), Carlsbad district, *e.g.*, Gobes, Drahowitz, Brunnensloh (Hüttner), Prague, Senftenberg (Fritsch); Moravia—Nikolsburg (Gillmer), Brünn, abundant (Schneider), Neutitschein, Rottalowitz (Fritsch); Upper Austria, throughout—Linz, Speyer, Wels, etc. (Brittinger), Pfenningsberg, Wels heath, Herndl, Gradenalm, Schoberstein, Weyer (Himsl), Ischl, Alt-Aussee, Gastein Valley (Hormuzaki), Baumgartenberg (Fritsch); Lower Austria, almost everywhere—Gresten (Schleicher), Vienna (Fritsch), Mödling (Rowland-Brown), Hernstein district (Rogenhofer); Salzburg—Salzburg (Fritsch), Moserboden (Neustetter), Rauris 4000ft.-5000ft. (Nickerl), the Gersberg, most abundant, the Gaisberg towards the Zistelalp (Richter); Vorarlberg—Bregenz, St. Anton to summit of Arlberg Pass, Fervallthal (Tutt); Tirol, throughout to 7500ft.—the Stubai-thal (Heller), the Dolomites—Schludersbach, Cortina, Croda di Lago, Sorraapis, Val Bigontina, Falzarego Pass (Tutt), Grödnertal (Neustetter), Taufers valley, Lappach, Jagdhaus (Weiler), Schlückerthal, Schindlerspitz, Zirler-Mäher, Stallen-Alp, Stanser-Joch, Waldrast, Hintereggerkogel, near Windisch-Matrei, Misurina, Seiser-Alp, Schlern, M. Baldo (Heller), Trafoi, Bozen, Eggenthal, Sarnthal, Meran, Mendel Pass, Neu Spondinig, Trafoi-thal and the Stelvio—Gomagoi, Franzenshöhe to Ferdinandshöhe (Tutt), Pejo, Campiglio (Chapman), Suldenthal (Tutt), the Brenner Pass (Rowland-Brown), Brenner district—Navisthal, Pfutzerthal, most abundant (Galvagni), Riva (Elwes), Hohe Salve, common (Hormuzaki), Innsbruck, Wilten (Fritsch); Carinthia, distributed, but occasionally absent—Raibl, not rare (Zeller), Lavantthal, St. Paul, Sau Alpe, once, Toplagraben, at Schwarzenbach, not rare, Friesach, Pörschach, the Dobratsch, frequent, Hermagor, frequent (Höfner), the Glockner, Predi (Neustetter), Heiligenblut, abundant (Hoffmann); Carniola, frequent—the Nanos, Weissenfels, Leenik, Feistenberg, Oberfeld, above Wippach (Hofner), Triglav (Neustetter), Josefthal (Mann); Dalmatia (Mann); Styria—Gratz (Poda), Gesäuse, Gstattmairvorlpe, Hall (Mühlán and Strobl); Croatia—mountain districts (*teste* Rebel), Samobor, Podused (Grund); Hungary, throughout abundant—Budapest district (Nicholson), Budafok, Isaszegh (Reverdin), Bresslova (Váγγελ-Jenő), Peszér, Eger, Fekete-Ardő, Esztergom, Pécs, Felsőlvő, Sopron, Pozsony, N. Lévárd, Tarnok, Besztercebánya, Selmeczbánya, Szliács, Gács, Rozsnyó, Kocsócz, Javorina, Igló, Brezova, Tatra, Eperjes, Kassa, Huszt, St. Gothárd, Székely-Volgy, Szűsz-Sebes, Nagyszeben, Nagygág, Réa, Vinkovcze, Josipdal, Fuzhine, Ogulin, Fiume, Porto-Ré, Novi, Czirkwenicza (Aigner-Abafi), Bucovina (Hormuzaki); Galicia—Cracow district, Wszedzie (Zebrawski); Lwow, Janow, Bileze (Nowicki); Transylvania—Kronstadt, Tomos Pass (Tutt coll.). BELGIUM : common on the banks of the Meuse and Ourthe, and similar situations, also near Brussels, Louvain (Dubois), Hau, Torgny, Ortho (Slégers), Namur, St. Servais, Dinant, Warnant, Bouge, common, etc. (Lambillion), Theux (Derenne), Denée, Sissoye, Tervueren



(Hennin), Waulsort, Florennes, Han-sur-Lesse (Derenne), Rochefort (Carlier). BOSNIA AND HERCEGOVINA: very common and generally distributed throughout up to 1100m. above the sea—Fojnica (Simonys), Zlijep, Visegrad (Sturany), Celebic, Foča (Nicholl), Trebevic (*teste* Rebel), Igman (at 800m.) (Burr), Prozor, Maklenpass (Hilf), Kalinovik (Schreitter), Konjica (Apfelbeck), Jablanica (*teste* Rebel), the Prenj—Risovac, Glogovo, at 850m. (Penther), Vran Planina, Velez, Tassovic, near Capljina (Hilf), Nevesinje (Uhl), Buerda, Gacko, Vucija bara, between Serajevo and Gorazda, Baba Planina (Nicholl), Jaice (Penther). BULGARIA AND EAST ROUMELIA: near Sophia, Kokaleny-Kloster (Bachmetjew), [? on the Rilo (Joakimow),] near Rustschuk (Kowatschew), near Slivno, very rare (Rebel). FRANCE: Ain—Gex, Col de la Faucille (Tutt), Ambérieu, Divonne (Reverdin), Thoiry, Bellegarde (Blachier); Aisne—Holnon wood, St. Quentin (Dubus); Alpes-Maritimes, generally (Bromilow), Cannes, abundant (Warburg), Monte Carlo (Reznicek), Beaulieu, Col de Tende, from Levens to St. Martin Vesubie, and above to Venanson and the Borréon (Rowland-Brown); Ariège—l'Hospitalet and down to Ax-les-Thermes (Rowland-Brown), St. Giron (Caradja); Ardèche—Celles-les-Bains (*coll.* Fallou); Aube, very common—Bar-sur-Aube, les Riceys, hill of Montgney, etc. (Jourdheuille); Aude, common (Mabille); Basses-Alpes, very common, Digne, Barcelonnette, Larche, St. André, Allos, Lac d'Allos, Colmars, Beauvèze, etc. (Tutt); Basses-Pyrénées—Biarritz (Rowland-Brown); Boûches-du-Rhône—environs of Marseille, and Ste. Baume (Siépi); Calvados—Rainville, Sallenelles, etc. (Fauvel); Amfréville, Eraines, etc. (Moutiers); Charente—very common between Jarnac and Rouillac (Giard); near Angoulême (Moore); Charente-Inférieure—Royan (Salis), St. Georges (Oberthür); Côte d'Or (Frionnet),—Nuits (Rehfous); Creuse—Guéret (Sand); Dordogne, very common, Bergerac, etc. (Tarel); Doubs, about Besançon (Bruand); Eure—Pont-de-l'Arche, very common, Côtes-des-Deux-Amants, Côtes d'Alizaz, Château Gaillard, near les Andelys (Dupont); Eure-et-Loir—Mée, Auneau, and generally (Guenée), *e.g.*, the Beauce plateau (Moore), Chartres (Oberthür); Gard—Pont-du-Gard (Tutt), St. Cécile-d'Andorge (Rowland-Brown); Gironde—common in the environs of Bordeaux (Robert Brown *in litt.*), Bouliac, Floirac, Fargues (Trimoulet); Haute-Garonne generally—St. Martory, Encausse, Aspet, Plateau de Montreich, Arguénos, St. Béat, Mont Cajire, Superbagnères (Caradja), Bagnères-de-Luchon (Elwes); Haute-Marne—Langres, Prauthoy, Latrecey, etc., rather common (Frionnet); Haute-Savoie—Salève, Monnetier, Veyrier, La Clusaz, St. Gervais, Megève, Montanvert, slopes above the Mauvais Pas, the Brévent, Argentières (Tutt), Tougues (Reverdin), Mt. Vuache (Blachier), Chamonix, and in the higher mountains generally (Rowland-Brown); Hautes-Alpes—Mont Genève (Oberthür), Pointe de la Lauze, Abriès, la Grave, le Lautaret (Tutt); Hautes-Pyrénées, 3000ft.-4000ft., Luz, etc. (Elwes), Argèles (Distant), St. Sauveur (Elwes), Pierrefitte - Nestalas (Jones), Gavarnie, Cauterets, and on the way up to Lac de Gaube (Rowland-Brown), very abundant route de Luz, Gèdre (Rondou), Héas, Pont de Seca (Harcourt-Bath); Indre—Nohant, Gargilesse (Sand), Brenne (Martin); Indre-et-Loire—near Amboise (Moore); Isère—Grenoble, Clelles, Bourg d'Oisans, Bourg d'Arud (Tutt), Allevard (Reverdin), the Romanche Valley (Harrison); Loir-et-Cher—forest of Russy, common (Chevillon); Loire-Inférieure—there are old records for Bourg-de-Basse-Coulaine, and la Haye-Foureaicière (Bureau); Lozère—Florac, la Caze, St. Enemie, Peyreleau, etc., very common on the Causse at Mende and Balsiège (Rowland-Brown); Maine-et-Loire—Milly, Chaloché (Delahaye), Angers (Cheux); Marne—Rheims (Demaison); Meurthe-et-Moselle—Maxéville, near Nancy (Cantener); Morbihan—Lantillac (*fide* Chabot); Nord—very rare, two examples in the forest of Clairs-Marais, etc. (Paux), Bournon wood, near Cambrai, common, rare elsewhere (le Roi); Oise—slopes of Lamorlaye, Forest of Chantilly (Pierret); Pas-de-Calais—between Hesdin and Crècy-en-Ponthieu (Rowland-Brown); Puy-de-Dôme—Clermont-Ferrand, Royat (Sand), limestone hills of the Limagne (Guillemot); Pyrénées-Orientales—very common above le Vernet, near Montlouis, etc. (Rowland-Brown), Céret (Carteron), Sorède (Sprüngerts), and generally (Rondou); Rhône—to the north-east of Lyon (Millière); Saône-et-Loire—common on the chalk, *e.g.*, la Grisière, near Mâcon (André); Sarthe (Desportes); Savoie—Bourg St. Maurice, Little St. Bernard, Mt. Révard, Grésy-sur-Aix, Chavoire, St. Michel de Maurienne, Lanslebourg (Tutt), Moutiers, Salins, Brides-les-Bains (Reverdin), Seine—formerly in the Bois de Boulogne (Godart), environs of Paris (Goossens), Bagneux (Tutt); Seine-et-Marne—Fontainebleau (Tutt), Montgérault (H. Brown); Seine-et-Oise, Lardy (H. Brown), Palais-Briques (Fallou); Somme—near Crècy, Corbie (Rowland-Brown *teste* le Cerf); Seine-Inférieure, very common (Noel), Bois de Belbeuf, Veules-en-Caux, Forest of Roumare, Sahurs (Viret), rocks of St. Adrien, Côte-des-

Grosses-Pierres de Deville, Canteleu (Lhotte), Orival (Martel), Tancarville (Leech), St. André, near Rouen (Oldaker); Var—Draguignan, Hyères (Tutt), Pardigon (Reverdin), between Cavalaire and le Canadel (Wheeler), Forêt du Dom (Powell), Ste. Maxime (Chapman); Vauluse—Avignon (Lang), Brantes (coll. H. Brown); Vendée, very rare (Oberthür); Vosges—St. Maurice-sur-Moselle, Charmes (Gibbs); Yonne, rather common (Loriferne). GERMANY: Almost everywhere in the southern half of the country in suitable localities, rarer in the north-east and central part, in the north-west not observed beyond a line passing through Garz-on-Oder, Berlin, Hanover, Verden, Bremen, Osnabrück, Münster, Elberfeld, Deutz, Bonn, and Aachen (Gillmer); Prussia—West Prussia very frequent, in southern East Prussia rare, in northern East Prussia only singly—Rastenburg, Willenberg, Thorn, Dantzig (Schmidt), Rauschen, Tapiau, Braunsberg, Frauenburg, Mohrungen, Osterode, Allenstein, Sensburg, Angerburg, Neidenburg, Damerau, Kulm, Graudenz, Munsterwalde, Rehlfeld, Marienburg, Elbing, Zoppot, Gora, Alt Kischau, Sartowitz, Jastrow (Speiser); Pomerania—Stettin district, absent, Garz-on-Oder, the Schwalbenberge, the Schrey, common, Eckerberg, singly (Hering); Hanover—Giesener Berg, abundant (Peets), Göttingen, frequent, Hameln, Osnabrück (Jordan), Hildesheim district—Galgenberg, Rotzberg, very common (Grote); Bremen—Bürgerwald, Woltmershausen (Rehberg); Westphalia—Arnsberg (Henze), Höxter, Münster, rare, Hagen, very rare, Warburg, common (Uffeln); Rhine Provinces—distributed, Rhine banks between Budberg and Friemersheim, rare, Bonn, Laacher Sea, Boppard, Bingen not rare, Aachen very rare, Uerdingen rare, Elberfeld, Barmen very rare, Deutz (Stollwerck), the Katernberg, the Fischerthal at Barmen, Hackhausen rare, Hilden (Weymer), Budberg and Mündelheim banks, common, Crefeld (Rothke); Hesse—local, Mörfeld road, Mombach marsh and forest, abundant, the Stadtwald singly, the Taunus near Königstein, Wiesbaden, the Niederwald, Odenwald, Giessen rare, Cassel (Koch), Frankfurt singly, Sonnenberg singly, the Bergstrasse, foot of the Frankenstein, common (Glaser), Mainz, Biebrich, abundant (Rössler), the Taunus Hills, rare (Prideaux), the Lehrhof Heath, near Hanau, rare (Limpert and Röttelberg), the Lindenberg (Borgmann), the Stahlberg, near Cassel (Knatz), Rotenburg (Jordan); Thuringia—in the plain and foothills, Rudolstadt (Jordan), Gotha, etc., frequent (Knapp), Jena (Trautmann); Province of Saxony—Erfurt (Kefenstein and Werneberg), Steigerwald and Willroda forest (*Ent. Ver. Erfurt*), Prössdorf near Zeitz (Wilde), Gera, frequent (*Ent. Ver. Gera*), Mühlhausen, abundant, Naumburg, Nordhausen (Jordan), near Halle, *e.g.*, Bennstädt, Mücheln, abundant, Dölau Heath, fairly frequent (Stange), Quedlinburg (Jordan), Wernigerode, rare (Fischer); Anhalt—Dessau, not rare (Richter), Zerbst, Hohe-Brücke, very frequent, Cöthen, *e.g.*, Mühlberg, near Crüchern and Kl. Zerbster Busch, frequent (Gillmer), near Kochstedt, Diesdorf, rare (Amelang), north-eastern edge of Hartz, rare, *e.g.*, Rumpfberg (Reinecke); Waldeck—Rhoden, Quast, Eichholz, frequent, Wildungen, Korbach, not rare, Arolsen, scarce (Speyer); Brandenburg—Rüdersdorf, frequent (Pflützner), Erkner-Fangschleuse, Potsdam, common, Jungfernhaide and Hirschgarten, rare (Burtel and Herz), Frankfurt-on-Oder, Dammvorstadt-Kirchhof, Tzschetzschnowe-Faule-See, the Seegründe near Cunersdorf, the Lebus-Berge (Kretschmer); Posen—the Eichwald, singly, Kobylepole, near Posen (Schultz), Posen, common (Schumann); Silesia—Brieg, not rare (Döring), the Trebnitz mountains, Bitke, common, Wiese to Peterwitz (Nohr), Southern Upper Lusatia, singly, Hohenberg, near Herwigsdorf, Gross-Schönau (Möschler), Sprottau, very common, Dittersdorf, Zeisdorf, Hochwald, Oberleschen, Nonnenbusch (Pflützner), Görlitz Heath, singly (Marschner); Kingdom of Saxony—locally abundant, Loschwitz, Plauenscher Grund, Heller, Lössnitz, Coswig, Weinböhla, Oberau, Gröbern (Steinert), Freiberg (Fritsche), Saxonian Upper Lusatia, Bautzen, rare (Schütze), Chemnitz, Leipzig (Pabst), Oelzschau, the Leina (*Ent. Ver. Leipzig*), Limbach, rare, Zwickau-Langenhessen, very rare (*Ent. Ver. Dresden*); Bavaria—Regensburg, very common (Schmid), Munich, abundant (Kranz), Augsburg, the Lech plain, Siebenischwald, Siebenbrunnenfeld (Freyer), Kempten, very frequent (Kolb), Berchtesgaden (Bentall); Württemberg—distributed throughout, Stuttgart, Tübingen, Reutlingen, etc. (Seyffer), near Esslingen, common (Keller and Hoffmann); Baden—distributed, Constance, the sources of the Danube, Istein, Freiburg (on the Schönberg), Kaiserstuhl, Lahr, Durlach, Heidelberg (Reutti), Lagern (Frey coll.), Bundorf (Leech), Black Forest (Walker), Karlsruhe, on the Turmberg, the Michaelsberg near Bruchsal, Maxau, Grötzingen (Gauckler); Rhine Palatinate—Speyer (Linz), between Mechttersheim and Lingenfeld, frequent, Neustadt, singly (Griebel); Alsace—Colmar, hill behind Ingersheim. Mühlhausen, banks of the Doller, Ste. Marie, Bouxwiller, between Ingwiller and Offwiller, Stras-

bourg, Rhine embankment towards Wautzenau, near Dorlisheim; Lorraine—Metz, Mont St. Quentin (Cantener). GREECE: Morea, Chelmos (Rebel). ? HOLLAND (3 ex-Staud., British Museum coll.). ITALY: Piedmont—Little St. Bernard Pass, Pré St. Didier, Courmayeur, Val Vénì to the Col de la Seigne, Val Ferrex to Col Ferrex, Cogne Valley, Châtillon, Val Tournanche to Breuil, Aosta, Torre Pellice, Bobbie, Au Pra to the Col de la Croix, 7500ft., Crissolo, Susa, Val Anzasca to Macugnaga (Tutt), Turin district—slopes of the Maddalena (Rocci), Certosa di Pesio (Norris), Val Vedro (Forbes), Val Vigizzo, near Domodossola (Carlini), Val Antigorio, Iselle, Varzo (Blachier); Lombardy—Lago di Loppio (Jones), Le Prese (Buchanan-White), between Chiavenna and Casaccia (Elwes), Bormio Bad (Tutt), Menaggio (Forbes), Brianza mountains (Turati), Esino, near Varenna (Fountaine), Monte Festina, Lama, Mocogno, Barigazzo, Frassinoro, Pian di Lagotti, Boccassuolo (Fiori); Roma—Roman Campagna (Calberla); Tuscany—almost everywhere—Plain of Mugnone, Poggioni, Florence, etc. (Stefanelli), Lucca (Walker), Pistoiese Apennines, San Marcello, Vallombrosa (Verity), Boscolungo (Norris), Fiesole, Assisi, between Assisi and Gubbio, Monte Oliveto (Wheeler), Foligno (Zeller); [Sardinia—Paderno, Sabbione (Bertolini); wants confirmation]; Emilia—Modena (Fiori); Venetia—Venice (Bromilow); Campania—Cassino, Mte. Cairo (Barraud), Mte. Aurunci (Querci); Liguria—Chiavari (Blachier), Pegli (Fountaine), Val Cairasca (Reverdin), Rapallo (Reznicek); Naples—Naples (Zickert); Sicily, once (Zeller). MONTENEGRO: the Durmitor (Apfelbeck). PORTUGAL (*teste* Dubois). ROUMANIA: extremely rare and local—near Comanesti, Jassy (Leon), north Dobrudscha (Mann), Rareu and Kimpolung on the Bucovina frontier (Hormuzaki). RUSSIA: St. Petersburg Government (Sievers);\* Wiatka Government, near Sarapoul, very rare (Kroulikowsky); Kasan Government—districts of Spassk, Tetinschi, Laischew, Tschistopol, rare (Kroulikowsky); Orenburg—Sergievskt, Busuluk, etc., but not in the lower Volga district (Eversmann); Poltawa Government (Markoff); Podolia—Bagovitza (Grum-Grshimailo), Ekaterinoslav (British Museum coll.); Transcaucasia—Manglis, Borjom, Kasikoparan, Hankynda, Lagodekhi, Istidara (Romanoff); Caucasus—Kutair, Abbastuman (Haberhauer), Helenendorf (Kindermann). SERBIA: Ak Palanka (Hilf). SPAIN: Asturias—Puerto de Pajares (Chapman); Leon—Jaca (Burr), Picos de Europa (Nicholl); Old Castile—Soria, Bronchales, Navalparal (Chapman), Noguera (Sheldon); New Castile—Cuenca, Avila, Tragacete (Chapman), Escorial (Oberthür); Catalonia—Caldas de Maravilla (Nicholl), Montseny (Witty), Barcelona (Jones), St. Cecilia (Standen), Montserrat (Burr), Calella, San Pol (Cuni-y-Martorell); Aragon—common, Albaracin. Moncayo, La Cueva de Agreda (Chapman). Valdevezar, La Losilla, Masegar, the Lindayos de Moscardon, Guadalaviar, Griegos (Zapater); Andalusia—throughout, very common—Granada, etc. (Rambur), Lanjaron (Nicholl), Sierra de Alfakar, Côte de Huejar (Oberthür). SWITZERLAND: Berne—Bernese Jura (Agassiz), between Lauterbrunnen and Wengen (Moss), above Grindelwald (Lowe), Gimelwald (Wheeler), Meyringen (Lang), Brunig to Meyringen (Keynes); Geneva—throughout, Versoix (Tutt), Veyrier, Satigny, Hermance (Blachier), Bois Taille (Reverdin); Glarus—Klonthal (Muschamp); Gisons—St. Moritz, Pontresina, Rosegthal, Preda, almost to summit of the Albulia Pass, Via Mala, Thusis to Sils, Fluela Pass, Sus, Lavin, Zernetz, Ofen Pass, Munsterthal, Muranzathal, Wormser Joch, Strela Pass, Landwasser Valley, Davos, Frauenkirch, Sertigthal, rare, Dischmathal, rare, etc. (Tutt), Bergün (Zeller), Alveneu Bad (Lemann), foot of the Mittenberg, Chur (Lowe), the Splugen (Rowland-Brown), Guarda (Chapman), Campfer (Jones), Suvretthal (Turner); Lucerne—Pilatus, between Hergiswyl and the summit (Keynes), the Rigi (Sanford), Vitznau (Tutt), Weggis (Tutt coll.); Neuchâtel—above Neuchâtel (Rowland-Brown); Schwyz—Brünnen (Turner); St. Gall—Weesen Marsh (Tutt), Ragaz (Reverdin); Ticino—St. Gothard Pass, Val Bedretto, Airolo, Faïdo, Piottino Gorge, Piotta, Brugnasco, Piora, Locarno, Lugano (Tutt), Fusio, Val Maggia (Blachier), San Salvatore (Tutt coll.), the Alpe Pianascio (Wheeler); Unterwalden—Engelberg (Bethune-Baker); Uri—Göschenen, Andermatt to 6000ft. (Tutt); Axenstrasse, Seeberg (Turner); Valais—Col de la Forclaz, Martigny, Tour de la Bâtiaz, Sion, Useigne, Evolène, Villars, Ferpée valley, Arolla, Visp to Mattmark, to Saas-Fée, and to Zermatt, Brig to Bérisal,

\* With regard to the Baltic Provinces, Nolcken states (*Faun. Lep. Livland, Estland, etc.*, i., p. 57) that Madame Lienig says she took *A. coridon* which escaped from her again. Gimmel also considers *A. thetis* as occurring here on Drümpelmann's authority. As both occur in Prussia, and are not considered at all rare, and according to Sievers are also found in St. Petersburg, there appears to be no reason why they should not be found here.

almost to summit of Simplon Pass and then to Iselle, Laquinthal, etc. (Tutt), Branson, Follaterres, Sierre, Chandolin, Randa, Täschalp, Almigel (Reverdin), moraines of the Glacier du Trient (Page), Savièze, Rossboden Alp (Rehfous), between Martigny and the Great St. Bernard (Walker), Zinal, Vissoye (Page), Rossinière (Tasker), the Bella Tola, Kanderthal (Forbes), Loèche, Alpien, Simplon, Saas-Thal, Almigel (Blachier), Pfynwald, Barmaz (Wheeler), Binnenthal (Keynes), Visp to Brigue (Weir), Col Ferret, Dent du Midi (Muschamp), Mt. Chemin, Entremont, Salquenen, Varône, Trift Alp, Baltschieder, Morel, Grengiols, Steinenthal (Favre); Vaud—Lausanne, Vevey, Roche, Yverne, Aigle (Tutt), le Sépey (Blachier), Vallorbe, Eclépens, les Avants, Sonzier, Veytaux, the Veraye gorge (Wheeler), Glion (Chapman), near Villars (Moss), Bex (Murray); Zürich—Staefa, between Einsiedeln and Bieberbrücke, rare (Tutt).

Genus: *Polyommatus*, Latreille.

SYNONYMY.—Genus: *Polyommatus*, Latr., "Dict. Hist. Nat.," xxiv., pp. 185, 200 (1804); "Hist. Nat. Crust. Ins.," xiv., p. 118 (1805); "Gen. Crust. Ins.," iv., pp. 206-7 (1809); "Cons. Gén.," pp. 355, 440 (1810); "Cuv. Règne Animal," iii., p. 553 (1817); Godt., "Enc. Méth.," ix., p. 690 (1819); Jermyn, "Butt. Coll. Vade-Mecum," p. 58 (1825); Stphns., "Illus. Haust.," i., p. 91 (1828); "Ins. Cat.," 1st ed., ii., p. 24 (1829); Bdv., "Eur. Lep. Ind.," p. 12 (1829); Meig., "Eur. Schmett.," ii., pp. 47, 48, pl. xlvii., figs. 5a-b, xlvi., figs. 1a-f, 2a-b (1830); Ramb., "Faun. And.," p. 269 (1839); Wood, "Ind. Ent.," p. 8, pl. iii., figs. 67-69 (1839); Humphr. and Westw., "Brit. Butts.," p. 107, pl. xxxiv., figs. 7-13 (1841); Stphns., "List," 1st ed., p. 2 (1850); 2nd ed., p. 18 (1856); Heinem., "Schmett. Deutsch.," i., p. 80 (1859); Curtis, "Brit. Ent.," v., p. 6 (ed. of 1862); Kirby, "Man.," p. 105 (1862); Rockstr., "Schmett. Raup.," p. 42 (1869); "Eur. Butts.," p. 48 (1879); Buckl., "Larvæ, i., pp. 111, 191, pl. xv., figs. 2-2c (1886); Dale, "Hist. Brit. Butts.," p. 70 (1890); Barr., "Lep. Brit. Isl.," i., p. 77, pl. xi., figs. 2-2j (1893); Tutt, "Brit. Butts.," p. 174, pl. iii., figs. 3, 4 (1896); "Ent. Rec.," vii., pp. 220, 300 (1896); Kirby, "Hndbk.," ii., p. 96 (1896); Grote, "Schmett. Hildesh.," p. 42 (1897); Wheeler, "Butts. Switz.," etc., p. 35 (1903); Tutt, "Nat. Hist. Brit. Lep.," viii., p. 313 (1906); "Ent. Rec.," xviii., pp. 130, 132 (1906); xxi., p. 108 (1909). *Papilio*, Poda, "Mus. Græc.," p. 76 (1761); Scop., "Ent. Carn.," p. 179 (1763); Hufn., "Berl. Mag.," ii., p. 72 (1766); Schaff., "Icones," pl. clxviii., figs. 6, 7, cclv., figs. 4, 5 (1766); Fuessl., "Verz.," p. 31 (1775); Schiff., "Schmett. Wien.," 1st ed., p. 184 (1776); Geoffr., "Fourc. Ent. Paris.," p. 244 (1785); Schneid., "Syst. Besch.," pp. 244, 250 (1785); Lang, "Verz.," p. 54 (1789); Schrfb., "Scriba Journ. Ent.," iii., p. 216 (1791); Thnbg., "Ins. Suec.," pt. ii., p. 39 (1791); Borkh., "Rhein. Mag.," i., p. 287 (1793); Don., "Brit. Ins.," iv., p. 93 (1795); Hübn., "Eur. Schmett.," pl. lx., figs. 292-294 (1795); Cuvier, "Tabl. Elém.," p. 591 (1798); "Raupen," pl. xxxiii., figs. 1a-b (1800); Hffmegg., "Ill. Mag.," iii., p. 185 (1803); Lasp., "Ill. Mag.," iv., p. 64 (1804); Herbst, "Nat. Sys. Ins.," xi., p. 205, pl. cccxii., figs. 10-12 (1804); Ochs., "Schmett. Sachs.," p. 328 (1805); Latr., "Nat. Hist. Crus. Ins.," xiv., p. 118 (1805); Hübn., "Eur. Schmett.," text, p. 48 (1806); Ill., "Rossi's Fn. Etrus.," 2nd ed., ii., p. 248 (1807); Ochs., "Die Schmett.," i., pt. 2, p. 38 (1808). [*Papilio-Plebeius*]-*Ruralis*, Fab., "Syst. Ent.," p. 525 (1775); v. Rott., "Naturf.," vi., pp. 21-22 (1775); Esp., "Eur. Schmett.," i., pt. 1, pp. 330, 332, 333, pl. xxxii. (supp. viii.), figs. 1, 2, 4; p. 335, pl. xxxiii. (supp. ix.), fig. 3 (1777); pp. 387-8, pl. l. (supp. xxvi.), figs. 2-3 (1779); pt. 2, p. 31, pl. lv. (contd. v.), fig. 5 (1778); pp. 134, 135, pl. lxxix. (cont. xxix.), figs. 1-2 (1781); Bergstr., "Nom.," ii., p. 77, pl. xlvii., figs. 1-2; p. 78, pl. xlviii., figs. 1-4; iii., p. 3, pl. xlix., figs. 3-4; p. 9, pl. liii., figs. 3-4; p. 11, pl. lv., figs. 5-6 (1779); Göze, "Ent. Beitr.," ii., pt. 3, p. 73 (1780); Fabr., "Sp. Ins.," ii., p. 123 (1781); "Mant. Ins.," ii., p. 75 (1787); Linn., "Sys. Nat.," 13th ed., i., pt. 5, p. 2349 (1788); Bork., "Sys. Besch.," i., pp. 161, 278 (1788); ? ii., p. 227 (1789); De Vill., "Car. Linn. Ent. Fn. Suec.," ii., p. 74 (1789); Rossi, "Fn. Etrus.," ii., p. 156 (1790); Brahm, "Ins. Kal.," ii., p. 461 (1791); Schwarz, "Raup. Kal.," i., p. 186 (1791); Haw., "Lep. Brit.," p. 45 (1803). [*Hesperia*]-*Ruralis*, Fab., "Ent. Syst.," iii., pt. 1, p. 299 (1793); Panz., "Sch. Icon. Ins.," p. 153, pl. cclv., figs. 4-5 (1804). *Cupido*, Schrank, "Fn. Boica," ii., p. 213 (1801); Kirby, "Syn. Cat.," p. 365 (1871). *Lycaena*, Leach, "Edin. Ency.," ix., pt. 1, p. 129 (1815); Oken, "Lehrb.," ii., p. 719 (1815); Ochs., "Die Schmett.," iv., p. 25 (1816); Sam., "Ent. Comp.," p. 242 (1819); Koll., "Schmett. (Estr.," p. 8 (1832); Treits., "Die Schmett.," x., pt. 1, suppl., pp. 69, 236 (1834); Freyr., "Neuere Beitr.," vii., pp. 29, 88, 133, pl. dexvi.,

eli., figs. 2, 3, pl. dclxxvi., figs. 1, 2 (1836); Bdv., "Gen. et Ind. Meth.," p. 11d (1840); Neust. and Korn., "Schmett. Schles.," p. 48, pl. xxii.-xxiii., figs. 73a-f (1842); H.-Sch., "Sys. Bearb.," i., p. 120 (1843); Evers., "Fn. Volg.-Ural.," p. 51 (1844); Dup., "Cat. Méth.," p. 32 (1844); Sélys-Longch., "Enum. Lép. Belg.," p. 4 (1845); Zell., "Isis," pp. 10, 152 *et seq.* (1847); Dbldy., "Syn. List," 1st ed., p. 1 (1850); Nick., "Lep. Böhm.," p. 18 (1850); Hdnr., "Lep. Eur. Cat. Meth.," p. 13 (1851); Gerh., "Mon.," p. 15, pl. xxvii., figs. 4a-c, xxviii., etc. (1852); Meyer-Dür., "Schmett. Schweiz.," p. 77 (1852); Westw. and Hew., "Gen. Diurn. Lep.," ii., p. 493 (1852); Led., "Verh. zool.-bot. Gesell.," ii., p. 20 (1852); Wllgrn., "Skand. Dagf.," p. 220 (1853); Köch., "Geogr. Verb.," p. 48 (1854); Mén., "Cat. Mus. Pet.," p. 57 (1855); Koch, "Schmett. Sudw. Deutsch.," p. 28 (1856); Stn., "Man.," i., p. 61 (1857); Ramb., "Cat. Lép. And.," p. 40 (1858); Speyer, "Geogr. Verb.," i., p. 85 (1858); Dbldy., "Syn. List," 2nd ed., p. 2 (1859); Now., "Enum. Lep. Hal.," p. 8 (1860); Zebr., "Lep. Krak.," p. 158 (1860); Staud., "Cat.," 1st ed., p. 5 (1861); Wilde, "Pflanz. Raup.," ii., p. 42 (1861); Now., "Mot. Gal.," p. 52 (1865); Rössl., "Schmett. Nass.," p. 17 (1866); Snell., "De Vlind.," i., p. 59 (1867); Berce, "Fn. Fr.," i., p. 139, pl. vi., figs. 5, 6 (1867); Nolck., "Lep. Fn. Estl.," i., p. 56 (1868); Bien., "Lep. Ergeb.," p. 29 (1869); Tengstr., "Lep. Fn. Fenn.," p. 2 (1869); Stange, "Schmett. Halle.," p. 3 (1869); Staud., "Cat.," 2nd ed., p. 11 (1871); Newn., "Brit. Butts.," p. 128 (1871); Mill., "Cat. Lép. Alp.-Mar.," p. 103 (1872); Bang-Haas, "Nat. Tids.," 3rd ser., ix., p. 395 (1874); Curò, "Bull. Soc. Ent. It.," vi., p. 111 (1874); Cuni-y-Mart., "Lep. Barc.," p. 20 (1874); Weym., "Jhrsb. Ver. Elberf.," p. 55 (1878); Sand, "Lép. Ber. Auv.," p. 6 (1879); Staud., "Hor. Soc. Ent. Ross.," xiv., p. 242 (1879); Frey, "Lep. Schweiz.," p. 18 (1880); Mosl., "Ill. Brit. Lep.," pt. vii., pl. iii. (1880); Peyerim., "Lép. Als.," p. 24 (1880); Rössl., "Lep. Wiesb.," p. 30 (1881); Jourdh., "Lép. Aube.," p. 18 (1883); Berce, "Lép. Fr.," p. 15, pl. iii., figs. 6, 7 (1884); Lang, "Butts. Eur.," p. 117, pl. xxv., fig. 4 (1884); Lampa, "Ent. Tids.," vi., p. 14 (1885); Kane, "Eur. Butts.," p. 42 (1885); Kill., "Ins. Graub.," p. 19 (1886); Auriv., "Nord. Fjär.," p. 13, pl. vi., figs. 8a-d (1888-91); de Nicév., "Butts. India.," iii., p. 74 (1890); Brom., "Butts. Riv.," p. 36 (1892); Reut., "Act. F. F. Fenn.," ix., pt. 6, p. 13 (1893); Leech, "Butts. China.," ii., p. 306 (1894); Rühl., "Pal. Gr.-Schmett.," pp. 267, 760 (1892-5); Meyr., "Hndbk.," p. 349 (1895); Obth., "Etudes.," xx., p. 23, pl. iv., figs. 41-47 (1896); Bachm., "Soc. Ent.," xi., p. 150 (1896); Favre, "Macr.-Lép. Val.," p. 19 (1899); Steff., "Bull. Ent. Soc. It.," xxxii., p. 336 (1900); Staud., "Cat.," 3rd ed., p. 84 (1901); Fleck, "Macr.-Lep. Rumän.," p. 21 (1901); Lamb., "Pap. Belg.," p. 231 (1902); Spuler, "Schmett. Eur.," p. 64 (1902); Verity, "Bull. Soc. Ent. It.," xxxvi., p. 138 (1904); Gillm., "Ent. Zeits. Gub.," xvii., pp. 76, 84 (1904); xix., p. 157 (1905); South, "Brit. Butts.," p. 163, pls. cvi., cvii., cxviii., figs. 1, 36, cxix. (1906); Grund, "Int. Ent. Zeits. Gub.," ii., pp. 79, 93 (1908); Gillm., "Ent. Wochtbl.," xxv., no. 6, p. 23 (1908); "Int. Ent. Zeits. Gub.," ii., pp. 1, 10, 153, 178 (1908); Seitz, "Gross.-Schmett.," p. 312 (1909); Rebel, "Berge's Schmett.," 9th ed., p. 70 (1909); Wagn., "Ent. Zeits. Stutt.," xxiii., p. 17 (1909); Gillm., "Int. Zeits. Gub.," iv., pp. 2-4 (1910). [*Zephyrus*-] *Cyaniris*, Dalm., "Handl. Sv. Vet. Akad.," p. 98 (1816). *Argus*, Dup., "Pap. Fr.," supp. i., p. 389 (1832); Cant., "Lép. Var.," p. 6 (1833); Zett., "Ins. Lapp.," p. 913 (1840). *Agriades*, Stphns., "Illus. Haust.," iv., p. 404 (1834). *Hesperia*, Butl., "Cat. Diurn. Lep.," p. 269 (1869).

The genus was founded independently to cover exactly the same ground as *Cupido*, Schrank. The type was fixed in 1804 as *argus* (= *icarus*) by Latreille, and confirmed by him, in 1809, as *icarus*, with reference to Hübner's figures 292-4. The genus *Polyommatus* was diagnosed (*Dict. Hist. Nat.*, xxiv., pp. 185, 200) in 1804, by Latreille, as follows:—

Bords internes des ailes inférieures formant un canal pour recevoir l'abdomen; palpes nus à leur extrémité, crochets des tarses très-petits, peu visibles, sans division—Genus *Polyommatus* (Polyommate) (*Dict.*, p. 185)—*Hesperia argus*, Fab. (*Dict.*, p. 200).

It is well-known that the *argus* of the early French authors, was *icarus*, the commonest species of France, and mentioned only by this name in all their lists. In 1804, Latreille gives "*argus*" as the type

of his genus *Polyommatus*: whilst, in 1805 (*Hist. Nat. Crust. et Ins.*, pp. 116-117), and again in 1809 (Scudder 1807) (*Gen. Crust. et Ins.*, iv., p. 206), where it is divided into sections Ia and b, and II, and then, in 1810 (*Considerationes Gen.*, etc., p. 440) (under the French name *Polyommate*), he gave *argus* as one of the species in the heterogeneous list included under the name *Polyommatus*. In 1817, Latreille details (*Cuvier's Règne Animal*, iii., 553) at length, one species as representing *Polyommatus*, which he notes as being designed for those lepidoptera, which have, for the greater part, small spots, imitating eyes, on their wings. The most common species in the neighbourhood of Paris, he says, is "the blue *Polyommatus*" (*Papilio alexis*, Hübner, pl. lx., figs. 292-294), the blue Argus of Geoffroy and Engramelle, "*Pap. Eur.*, xxxviii., no. 80 g-h." He then gives a detailed account of *icarus* as we know it, and thus confirms his action of 1804, in fixing this species as the type. In 1818, Latreille also rightly cites (*Nouv. Dict.*, new ed., xxvii., p. 495) to *alexis*, Hb., "l'argus bleu" of Geoffroy, which he had previously cited to "*argus*, Fab.," thus showing what he understood by *argus*, when, in 1804, he fixed it as the type of *Polyommatus*. The overlooking of Latreille's earliest description of the genus in 1804, by Scudder (*Historical Review*, p. 253), led the latter wrongly to cite *boeticus*, Linn., as the type of this genus.

As from the first, the type had been fixed for the genus, it is not necessary to show how various authors (including Latreille) used the genus *Polyommatus* as synonymous with *Cupido*, Schrank, to include all the Ruralids—hairstreaks, coppers, and blues—but we may mention that Stephens, in 1828 (*Ill. Brit. Ent. Haust.*, i., p. 83) restricted it to the "blues," and Boisduval (*Icones*, etc., p. 43) and Duponchel (*Pap. Fr.*, supp. i., p. 391), in 1832, used it for the "coppers," whilst Rambur, in 1839 (*Faun. Ent. And.*, p. 264), and Westwood, in 1840 (*Gen. Syn.*, p. 88), reverted to its proper restriction to the "blues," and Herrich-Schäffer, in 1844 (*Sys. Bearb.*, i., pp. 111 *et seq.*), again used it for the "coppers." Since then there has been no fixed method, although Kirby, in 1870 (*Journ. Linn. Soc. Lond.*, x., p. 500), and Scudder, in 1875 (*Hist. Sketch*, p. 253), both insisted that the name must be restricted to the "blues."

Accepting Latreille's original limitation of the type to "l'argus bleu" of Geoff., Engram.=*alexis*, Hb., *Eur. Schmett.*, lx., figs. 292-294, it follows that our restricted *Polyommatus* includes Herrich-Schäffer's subdivision of the genus *Lycaena*, diagnosed (*Sys. Bearb.*, pp. 112, 118 *et seq.*) as follows:—

I. *Alæ posteriores ecaudatæ.*

A. *Subtus ante limbum maculæ rufæ.*

A. *Inter lunulam mediam et basin alarum anteriorum ocellus unus aut alter.*

1. *Ocellus cellulæ 6 alarum posteriorum linea recta inter ocellos cellulæ 5 et 7 positus.*

b. *Alæ posteriores subtus inter seriem ocellorum et maculas limbales cellulæ 3 et 4 albæ.*

a. *Ciliæ immaculatæ; alæ anteriores et posteriores subtus concolores—alexis, Fab., eros, Ochs., eroides, H.-Sch., boisduvalii, H.-Sch.*

The superficial characters on which Herrich-Schäffer's grouping is made, necessitate some considerable misplacing of certain species, and we are inclined to include *eros*, Ochs., *venus*, Staud., *stoliczkana*,



Felder, *candalus*, H.-Sch., *icarus*. v. Rott., *sarta*, Alph., *amandus*, Schn., *myrrha*, H.-Sch., *isaurica*, Staud., *hylas*, Esp., and *escheri*, Hb., as belonging to this section. The group has also a wide distribution in the Indian region, and, of de Nicéville's supposed species (*Butts. India*, iii., pp. 71 *et seq.*), *ariana*, Moore, *stoliczka*, Felder, *sutleja*, Moore, *fugitiva*, Butler, *persica*, Butler, *kashgharensis*, Moore, *yarkundensis*, Moore, *nadira*, Moore, and *pseuderos*, Moore, certainly appear to belong here. Some of these, as will be seen later, we treat merely as forms of *P. icarus*. Our restricted *Polyommatus* comprises, therefore, de Nicéville's *Lycaena*, group B (*Butts. of India*, iii., p. 68) (except *devanica*, Moore), which he describes at considerable length, and of which he notes (*op. cit.*, pp. 70-71): "The second group has the ♂s more or less blue on the upperside, the ♀s brown, sometimes with irrorated blue scales at the base of the wings. The underside of both sexes in all the species is greyish-brown or greyish, with black spots surrounded with white; in a few species there is a white discal streak on the hindwing," etc. The great differences in the ancillary appendages of the species of the genus *Plebeius* (*sens. strict.*) and the other genera included in the tribe *Plebeii*, have already been pointed out (see preceding vol., pls. xx., xxi., xxii., and l.), whilst the comparative similarity of those of *Cyaniris*, *Polyommatus*, and *Agriades*, is equally well shown on plates xxi and xxii. As between *Polyommatus* (*icarus*) and *Agriades* (*coridon*, *thetis*), comparison should be made of the figures of these structures as pictured in pl. xxi., figs. 3 and 4, and pl. xxii., figs. 3 and 4. The comparative descriptions of the ancillary appendages of *Agriades* and *Polyommatus* (*op. cit.*, p. 157), as already published, read as follows:—

**AGRIADES:** As exemplified in *coridon* and *thetis*, it is not so very difficult to separate this from *Polyommatus* (*icarus*), but in other species that appear to have to be divided between these groups, the separation is much more so. This group exhibits a dorsal process with well-developed wing; the hook has a large square base, from which the comparatively slender, rather S-shaped, curved, upper part, arises at about a right angle, and ends opposite the middle of the dorsal process.

**POLYOMMATUS:** As exemplified in *icarus*, *eros*, etc., this group possesses a less heavy base to the clasp, a less slender upper portion, and its curvature is simple. In *Polyommatus* the hard process of the clasp is rather shorter than in *Agriades*. In both there is a soft process between the two divisions of the clasp [which often swells out in preparation in a balloon-like way]; whether this be regarded as a part of the soft process of the clasp, or a development of the membrane between the two processes does not much matter; but its considerable development is characteristic of these two genera.

Chapman adds that, without reference to the generic value of the difference in the characters indicated, the following points are noted as distinguishing the ♂ ancillary appendages of *Polyommatus* (*icarus*) from those of *Agriades* (*coridon* and *thetis*):—

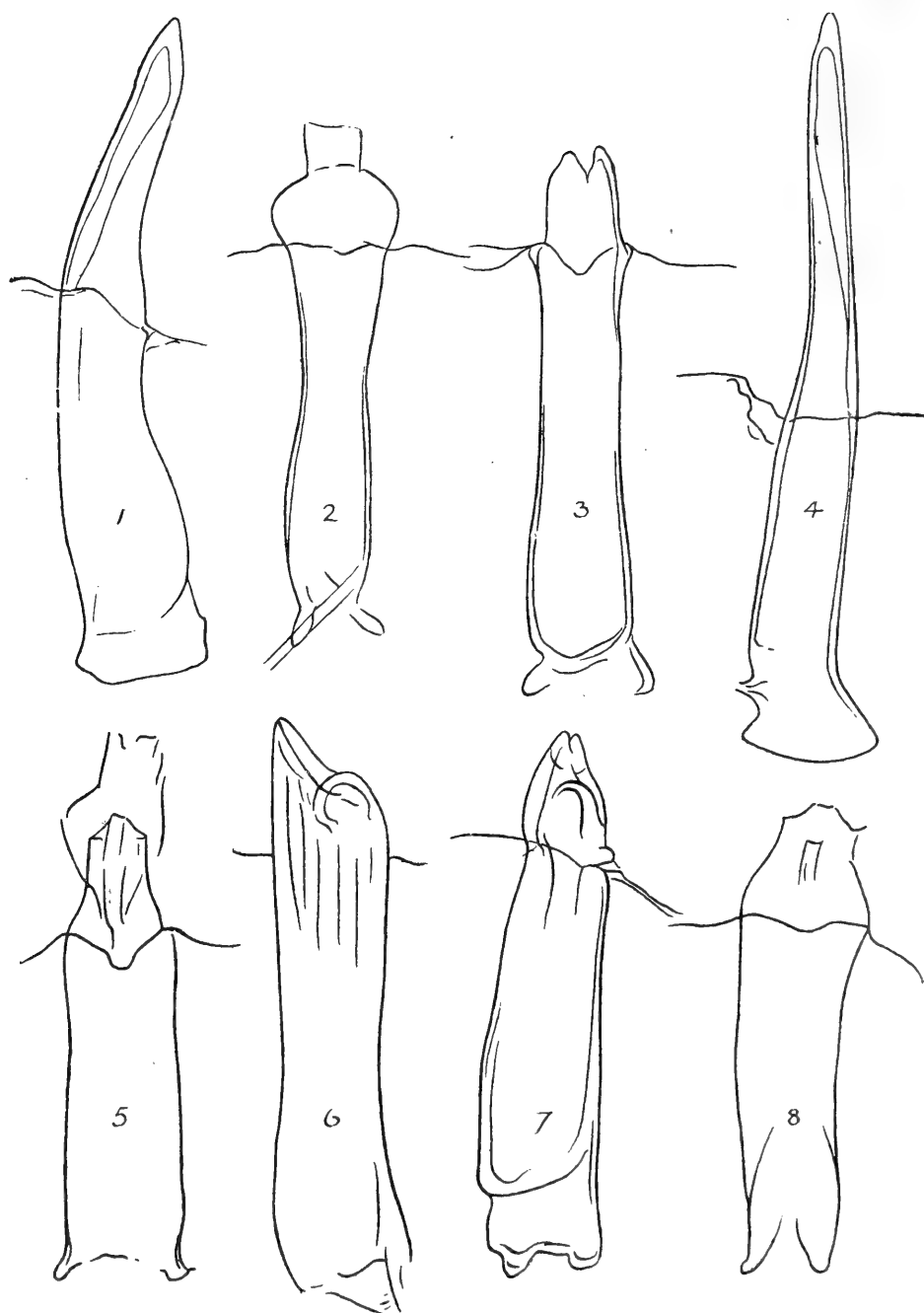
1. The dorsal processes are in *Polyommatus* (*icarus*) broader, and have a transverse ridge across the hollow of the scoop; in *Agriades* (*coridon* and *thetis*), what is apparently the same ridge is nearly longitudinal.

2. The hooks in *Polyommatus* (*icarus*) are, as regards the angulation, intermediate between those of *A. thetis* and *A. coridon*, but the point is much more curved in the two latter.

3. The serrated point of the clasps has nearly the same number of teeth—*A. thetis*, 13, *A. coridon*, 17, *P. icarus*, 16, or thereabouts—but the head which carries them is more bent backwards in *Agriades*, projects a little forward in *Polyommatus* (*icarus*), and is, in the latter, rather smaller, so that the teeth are closer together, and stand up as rectangular points, rather than as teeth of a saw with the posterior margin five or six times as long as the other.







Del. T. A. Chapman.

THE AEDEAGUS OF THE PLEBEID GENERA OF BLUES.

[To face p. 111.]

4. The ædæagus is almost the same in the two species of *Agriades* (*thetis* and *coridon*), in which it is slightly bulbous, and its membranous attachment to the other appendages is similar, and it has only a very short portion beyond. In *Polyommatus* (*icarus*) it is more slender, rather angular at its point of attachment, and has a portion of considerable length beyond. This is perhaps the most striking difference that can be detected between *Polyommatus* (*icarus*) and the two species of *Agriades* (*thetis* and *coridon*).

Whilst the genitalic differences between *Polyommatus* and *Agriades* must be considered as exceedingly close, those of *Aricia* and *Polyommatus*, the species of which are usually thrown together, are remarkably distinct, in fact, as already pointed out in the preceding volume (p. 156), *Aricia* is, after *Plebeius*, the most separable and distinct section with British representatives of the tribe *Plebeidi*. There is no need to repeat here the differential characters of *Aricia* as there noted, and it will be readily granted that these differences clearly support the generic separation of the latter genus from *Polyommatus*. As comparative differential characters, Chapman notes (*in litt.*) the following details:—

1. The dorsal portion is, in *Aricia* (*astrarche*), narrower, or at least so oriented as not to be easily spread out as that of *Polyommatus* (*icarus*) can. The ridge noted in *Polyommatus* (*icarus*) as somewhat transverse, and more longitudinal in *Agriades* (*coridon*), is, in *Aricia*, if it be the same ridge, longitudinal, but proceeds from the tip of the process, and has a remarkable bend in its middle. The hooks are smaller in *Aricia* (*astrarche*), with a broad basal portion, and with the distal portion narrow, yet not tapering, but, indeed, with a rather broader wider point.

2. In *Aricia* (*astrarche*) the serrated end of the clasp has not the scimitar outline of *Agriades* (*coridon*, *thetis*) or *Polyommatus* (*icarus*), but is simply tapered with a rounded end, and seems much less a separate portion of the clasp than in these species. The clasp of *Aricia* (*astrarche*) is specially remarkable amongst *Plebeiid* genera, in having along one surface down the middle of more than its distal half, rows of points or serrations, or raised spines, whose actual site would seem to be the opposite margins of the soft and spinous portions of the clasp, albeit these two portions are here very closely amalgamated, and not clearly distinguishable.

3. Another very distinctive structure is the ædæagus, which, instead of the short square (roughly speaking) outline seen in those of *Agriades* (*coridon*) and *Polyommatus* (*icarus*), tapers in *Aricia* (*astrarche*) from its base, to a very sharp point, and of this length more than half is beyond the membranous attachment which is marked by chitinous projections.

We have already noted (*suprà*) Chapman's remark on the difference in the ædæagus of *Polyommatus* (*icarus*) and that of *Agriades* (*coridon* and *thetis*). He deals (*Ent. Rec.*, xxii., pp. 101 *et seq.*) with the matter at length, noting among other interesting details that "the ædæagus affords very distinct forms in *Agriades* (*coridon*, etc.) and *Polyommatus* (*icarus*, etc.), and separates these two genera, for which, at present, no differentiating characters have been proposed." He then states that, of the *Plebeiid* genera, *Agriades* has, perhaps, the most easily recognised form of ædæagus, well seen (*antèa*, vol. x., pl. xxi., fig. 4), as a straight shaft, with a contracted neck at the base, but, most characteristically, a bulbous swelling at the top. Further, in *Agriades*, the ædæagus is attached to the floor of the genital cavity, through which it passes, in a zone that is on the bulbous swelling near its lower margin, so that the portion of the organ above the membrane is merely the upper part of the bulb and a small projection beyond the zone of attachment. *Polyommatus* agrees with *Agriades* in having a comparatively small portion beyond, but this portion is a shade longer, and differs entirely in that it tapers from the zone onwards, and has no trace

of a bulb; this portion is also of much slighter texture than the bulb in *Agriades*, which is a dense and highly chitinated structure. Based on this character, *Polyommatus* would comprise *amor*, Staud., *candalus*, H.-Sch., *celina*, Aust., *eros*, Ochs., *hunza*, Gr.-Gr., *martini*, All., *meleager*, Esp., *psylorita*, Frr., *sarta*, Alph., *venus*, Staud., *icarus*, v. Rott. (with its many forms—*persica*, Butl., *icadius*, Gr.-Gr., etc.).

The egg of *Polyommatus* is very characteristically Lyncæid in form and general appearance, but differs considerably from the much more specialised Agriadid egg with its flattened top, high and large marginal cells, and widely-opened lateral cells.\* In *Polyommatus* the cells of the upper surface are more like those of the sides, the pillars and knobs at the angles of the reticulation, commencing before, and not directly at, the margin, as in *Agriades*.

The larvæ of *Polyommatus* (*icarus*) and *Agriades* (*coridon* and *thetis*) are very similar when young, but certain differences become marked by the time the third (hybernating) instar is reached. The most marked differences are in the character of the hairs and the hairbases. In the case of *Polyommatus* it is difficult to be sure that the hair-base is other than perfectly smooth, whereas, in *Agriades* (as already noted), the hairbases are of a markedly stellate character; the development of stellate points to the hairbases is, however, to be noted on the thorax (prothoracic plate), and along the posterior margin of the segments, but even then to nothing like the degree noticeable in *Agriades*. In the last instar there is also a marked difference in the hairs themselves, those of *Polyommatus* (*icarus*) being (broadly) straight, smooth, and tapered, whilst in *Agriades* they develop into all sorts of short, curved (even recurved), clubbed and rough (spiculated) forms, e.g., on the 7th abdominal segment (on which the honey-gland is situated), the hairs in *Agriades* are short, clubbed or fungiform in *A. coridon*, and more bent, almost hooked in *A. thetis*, whilst, in *Polyommatus*, they are much fewer in number, and the extreme forms near the gland are blunt-ended, and of nearly equal thickness throughout, not extremely short, but many of them curved through nearly a right angle; the blunt end and this bend are, in fact, all that the hairs here do to assume the curious forms, apparently most abundant near the honey-gland in so many larvæ of "blues," etc. In *Polyommatus* (*icarus*), also, one finds between the honey-gland and the spiracle, three fairly long hairs (of group iii), of which nothing is seen in *A. coridon* or *A. thetis* (Chapman).

The pupa of *Polyommatus* (*icarus*), though very similar to *Agriades* (*coridon* and *thetis*) in its apparent smoothness, want of cremastral hooks, etc., is very different in the structure of its hairs, which, simple or slightly clubbed in *Agriades*, are more strongly clubbed, the clubs with well-developed spicules, in *Polyommatus*. The larva makes a weak sort of cocoon, which acts to some extent as a support, but it does not appear to enter the ground as does the larva of *Agriades*.

The sexual dimorphism in the genus *Polyommatus* is most marked, the ♂s blue in colour, the ♀s brown, usually with more or less well-developed submarginal lunules, although, in some species, the ♀s are

\* The egg of *A. thetis* is described (preceding vol., pp. 359-60) as having cells 0.04mm. across; they are much larger than those of *P. icarus*, and the measurement is a misprint for 0.07mm. Those of *P. icarus* are 0.04mm., of *Agriades thetis* larger, viz., 0.07mm.

aberrationally or locally strongly scaled with blue. They are usually active species on the wing, and, as the larvæ are almost entirely confined to low-growing leguminous plants for food, they usually keep near the ground, and live in meadows, fields, waste slopes, wayside places, the outskirts of, or open places in, woods, or similar places where their foodplants grow.

The species of our genus *Polyommatus* have a wide distribution, extending abundantly over the whole of the Palæarctic region (including Mauretania), and entering into the Indian region. Some of the species extend up the mountains to very high altitudes, *P. eros*, in the Alps of Central Europe reaching a height of 7000-8000 feet.

### POLYOMMATUS ICARUS, v. Rott.

SYNONYMY.—Species: *Icarus*, v. Rott., "Naturf.," vi., pp. 21-22 (1775); Esp., "Eur. Schmett.," i., pt. 1, p. 333, pl. xxxi. (supp. viii.), fig. 4 (1777); pt. 2, pp. 31, 135, pl. lv. (cont. v.), fig. 5, pl. lxxix. (cont. xxix.), fig. 2 (1779); Schneid., "Syst. Besch.," p. 244 (1785); Bkh., "Syst. Besch.," i., p. 278 (1788); De Vill., "Car. Linn. Ent. Fn. Suec.," ii., p. 74 (1789); Schwarz, "Raup. Kal.," i., p. 186 (1791); Schrfnb., "Scriba's Journ.," p. 216 (1791); Lewin,\* "Ins. Gt. Brit.," p. 80, pl. xxxviii., figs. 4, 5, 8 (1795); Haw., "Lep. Brit.," p. 45 (1803); Hbst., "Nat. Sys. Ins.," xi., p. 205, pl. cccxii., figs. 10-12 (1804); Panz., "Icon.," p. 153 (1804); Hüb., "Verz.," p. 101 (1816-18); Meig., "Eur. Schmett.," ii., p. 24, pl. xlviii., figs. 1a-f (1830); Freyer, "Neu. Beitr.," vii., p. 88, pl. deli., figs. 2, 3 (1836); Led., "Verh. zool.-bot. Gesell.," ii., p. 20 (1852); Hein., "Schmett. Deutsch.," i., p. 80 (1859); Now., "Enum. Lep. Hal.," p. 8 (1860); Staud., "Cat.," 1st ed., p. 5 (1861); Kirby, "Man.," p. 105 (1862); Now., "Mot. Gal.," p. 52 (1865); Rössl., "Schmett. Nass.," p. 17 (1866); Snell., "De Vlind.," p. 59 (1867); Berce, "Fn. Fr.," i., p. 139, pl. vi., figs. 5, 6 (1867); Nolck., "Lep. Fn. Estl.," i., p. 56 (1868); Rocks., "Schmett. Raup.," p. 42 (1869); Stange, "Schmett. Halle.," p. 3 (1869); Bien., "Lep. Ergeb.," p. 29 (1869); Tengst., "Lep. Fn. Fenn.," p. 2 (1869); Newm., "Brit. Butts.," p. 128 (1871); Kirby, "Syn. Cat.," p. 365 (1871); Staud., "Cat.," 2nd ed., p. 11 (1871); Bang-Haas, "Nat. Tids.," ix., 3rd ser., p. 395 (1874); Curò, "Bull. Soc. Ent. It.," vi., p. 111 (1874); Cuni-y-Mart., "Lep. Barc.," p. 20 (1874); Weym., "Jahresb. Ver. Elberf.," p. 55 (1878); Sand, "Lép. Ber. Auv.," p. 6 (1879); Staud., "Hor. Ent. Soc. Ross.," xiv., p. 242 (1879); Peyerim., "Lép. Als.," p. 24 (1880); Rössl., "Lep. Wiesb.," p. 30 (1881); Kirby, "Eur. Butts.," p. 48 (1882); Jourdh., "Lép. Aube.," p. 18 (1883); Lang, "Butts. Eur.," p. 117, pl. xxv., fig. 4 (1884); Lampa, "Ent. Tids.," vi., p. 14 (1885); Kane, "Eur. Butts.," p. 42 (1885); South, "Ent.," xx., p. 74, pl. ii., figs. 1-9, 11 (1887); Kill., "Ins. Graüb.," p. 19 (1886); Auriv., "Nord. Fjär.," p. 13, pl. vi., figs. 8a-d (1888); Dale, "Hist. Brit. Butts.," p. 70 (1890); de Nicév., "Butts. Ind.," iii., p. 74 (1890); Brom., "Butts. Riv.," p. 36 (1892); Rühl, "Pal. Gr.-Schmett.," pp. 267, 760 (1892-5); Reut., "Acta F. F. Fenn.," ix., pt. 6, p. 13 (1893); Leech, "Butts. China.," ii., p. 306 (1894); Meyr., "Handbk.," p. 349 (1895); Tutt, "Brit. Butts.," p. 174, pl. iii., figs. 3, 4 (1896); Bachm., "Soc. Ent.," xi., p. 150 (1896); Kirby, "Hndbk.," ii., p. 96, pl. xlv., figs. 7-9 (1896); Grote, "Schmett. Hildesh.," p. 42 (1897); Favre, "Macr.-Lép. Val.," p. 19 (1899); Steff., "Bull. Soc. Ent. It.," xxxii., p. 336 (1900); Staud., "Cat.," 3rd ed., p. 84 (1901); Fleck, "Macr.-Lép. Rumän.," p. 21 (1901); Spuler, "Eur. Schmett.," p. 60 (1902); Lamb., "Pap. Belg.," p. 231 (1902); Verity, "Bull. Soc. Ent. It.," xxxvi., p. 138 (1904); Gillm., "Ent. Zeits. Gub.," xix., p. 157 (1905); Tutt, "Brit. Lep.," viii., p. 313 (1906); "Ent. Rec.," xviii., pp. 130, 132 (1906); South, "Brit. Butts.," p. 163, pls. cvi., cvii., cxviii., figs. 1-3 (1906); Gillm., "Ent. Wochtbl.," xxv., no. 6, p. 23 (1908); "Int. Ent. Zeits. Gub.," ii., pp. 1, 10 (1908); Grund, "Int. Ent. Zeits. Gub.," ii., pp. 79, 93 (1908); Wagn., "Ent. Zeits. Stutt.," xxiii., p. 17 (1909); Tutt, "Ent. Rec.," xxi., p. 108 (1909); Rebel, "Berge's Schmett.," 9th ed., p. 70 (1909); Seitz, "Gross-Schmett.," p. 312 (1909). **Argus**,† Poda, "Mus. Gr.," p. 76 in part

\* The name *icarus* is here referred to Linné.

† The descriptions given by Linné in the 1st ed. (1746) of the *Fauna Suecica*, pp. 246, 247, of his *Papilio*, no. 803, 804, would have seemed to refer to the ♂ and ♀ of this species, but they are quoted in the 2nd ed. (1761), pp. 283, 284, as being equivalent respectively to *argus* and *idas*, i.e., to *argus (aegon)*, ♂ and ♀.

(1761); Hufn., "Berl. Mag.," ii., p. 72 (1766); Fabr., "Syst. Ent.," p. 525 *in part* (1775); Fuess., "Verz.," p. 31 (1775); Geoff., "Fourc. Ent. Par.," p. 244 (1785); Rossi, "Fn. Etrus.," ii., p. 156 *in part* (1790); Don., "Brit. Ins.," iv., p. 93, pl. cxliii., fig. 1 (1795); Cuv., "Tabl. Elem.," p. 591 (1798); Latr., "Dict. Hist. Nat.," xxiv., pp. 185, 200 (1804); "Hist. Nat. Crus. Ins.," xiv., p. 118 (1805); Ill., "Rossi's Fn. Etrus.," 2nd ed., ii., p. 248 (1807); Latr., "Gen. Crus. Ins.," iv., p. 206-7 (1809); "Cons. Gén.," pp. 355, 440 (1810). **Agestis**, Schiff., "Schmett. Wien.," 1st ed., p. 184, ♂ (1776); Lang, "Verz.," p. 54 (1789); Lasp., "Ill. Mag.," iv., p. 64 (1804). **Alexis**,\* Scop., "Ent. Carn.," p. 179, vars. 2, 3, and perhaps 1 (1763); (?) Rott.,† "Naturf.," vi., p. 22 (1775); Schiff., "Schmett. Wien.," p. 184 (1776); Göze, "Ent. Beitr.," ii., pt. 3, p. 73 (1780); Brahm, "Ins. Kal.," ii., p. 461 (1791); Bork., "Rhein. Mag.," i., p. 287 (1793); Hübn., "Eur. Schmett.," pl. lx., figs. 292-4 (1796); "Raup.," pl. xxxiii., figs. 1a-b (1800); Ill., "Schmett. Wien.," 2nd ed., ii., p. 271 (1801); Schrank, "Fn. Boica," ii., p. 213 (1801); Ochs., "Schmett. Sachs.," p. 328 (1805); Hübn., "Eur. Schmett.," text, p. 48 (1806); Ochs., "Die Schmett.," i., pt. 2, p. 38 (1808); Oken, "Lehrb.," ii., p. 719 (1815); Dalm., "Handl. Sv. Vet. Akad.," p. 98 (1816); Latr., "Nouv. Dict.," new ed., p. 495 (1818); Godt., "Enc. Méth.," ix., p. 690 (1819); "Pap. Fr.," i., p. 212 (1821); Stphns., "Illus. Haust.," i., p. 91 (1828); "Ins. Cat.," 1st ed., ii., p. 24 (1829); Bdv., "Eur. Lep. Ind.," p. 12 (1829); Dup., "Pap. Fr.," supp. i., p. 389 (1832); Cant., "Lép. Var.," p. 6 (1833); Treits., "Die Schmett.," x., pt. 1, supp., pp. 69, 236 (1834); Freyr., "Neu. Beitr.," vii., p. 29, pl. dcxvi. (1836); Ramb., "Fn. And.," p. 269 (1839); Wood, "Ind. Ent.," p. 8, pl. iii., fig. 69 (1839); Bdv., "Gen. Ind. Ent.," p. 11 (1840); Zett., "Ins. Lapp.," p. 913 (1840); Humph. and Westw., "Brit. Butts.," p. 107, pl. xxxiv., figs. 7-13 (1841); Neust. and Korn., "Schmett. Schles.," p. 48, pl. xxii. and xxiii., figs. 73a-f (1842); H.-Sch., "Sys. Bearb.," i., p. 120 (1843); Evers., "Fn. Volg.-Ural.," p. 51 (1844); Dup., "Cat. Méth.," p. 32 (1844); Sélys-Longch., "Énum. Lép. Belg.," p. 4 (1845); Zell., "Isis," pp. 10, 152 *et seq.* (1847); Dbldy., "Syn. List.," p. 1 (1850); Stphns., "List.," 1st ed., p. 2 (1850); Nick., "Syn. Lep. Böhm.," p. 18 (1850); Hdnr., "Lep. Eur. Cat. Meth.," p. 13 (1851); Westw. and Hew., "Gen. Diurn. Lep.," ii., p. 493 (1852); Gerh., "Mon.," p. 15, pl. xxvii., figs. 4a-c, pl. xxviii., pl. xxxv., fig. 2, pl. xxxviii., figs. 8, 9 (1852); Meyer-Dür, "Schmett. Schweiz.," p. 77 (1852); Wllngr., "Skand. Dagsf.," p. 220 (1853); Koch, "Geogr. Verb.," p. 48 (1854); Mén., "Cat. Mus. Pet.," p. 57 (1855); Stphns., "List.," 2nd ed., p. 18 (1856); Koch, "Schmett. Sudw. Deutsch.," p. 28 (1856); Stn., "Man.," i., p. 61 (1857); Ramb., "Cat. Lép. And.," p. 40 (1858); Speyer, "Geogr. Verb.," i., p. 85 (1858); Zebr., "Lep. Krak.," p. 158 (1860); Wilde, "Pflanz. Raup.," ii., p. 42 (1861); Butl., "Cat. Diurn. Lep.," p. 269 (1869); Frey, "Lep. Schweiz.," p. 18 (1880); Mosley, "Ill. Br. Lep.," pt. vii., pl. iii. (1880); Berce, "Lep. Fr.," p. 15, pl. iii., figs. 6, 7 (1884); Buckl., "Larv.," i., p. 111, pl. xv., figs. 2-2c (1886); Barr., "Lep. Br. Isl.," i., p. 77, pl. xi., figs. 2-2j (1893); Obth., "Etudes," xix., p. 14, pl. vi., fig. 52 (1894); xx., p. 23, pl. iv., figs. 41-47 (1896); Wheel., "Butts. Switz.," etc., p. 35 (1903). **Medon** (?), Esp., "Eur. Schmett.," i., pt. 1, p. 330, pl. xxxii. (supp. viii.), fig. 1 (1777). **Thetis**, Esp., "Eur. Schmett.," i., pt. 1, pp. 332, 335, pl. xxxii. (supp. viii.), fig. 2; xxxiii. (supp. ix.), fig. 3 (1777). **Polypheumus**, Esp., "Eur. Schmett.," i., pt. 1, p. 387, pl. 1. (supp. xxvi.), figs. 2-3 (1777); Göze, "Ent. Beitr.," ii., pt. 3, p. 71 (1780); Schneid., "Sys. Beschr.," p. 250 (1785). **Pampholyge**, Bergs., "Nom.,"

\* *Alexis*, Poda, is an older name than *icarus*, v. Rott., but cannot possibly belong to this species. Poda's original description is as follows:—*P. P. alexis*: wings quite entire, fuscous, ash-grey beneath; the primaries with five sub-ocellate spots, the secondaries with two obsolete ones. On the disc of the primary wings are five contiguous sub-ocellate spots increasing in size, and a solitary oblong spot, the lunate margin without colour (Poda, *Ins. Gr.*, p. 77, no. 47). The expression "magnitudine crescentes" would seem at first sight to refer to *cyllarus* (♀ of course, as being fuscous), and *alexis*, Poda, was taken to refer to this species by Fabricius (*Mant. Ins.*, ii., p. 72; *Ent. Sys.*, iii., pt. 1, p. 294), Ochsenheimer (*Schmett. Deutsch.*, i., pt. 2, p. 12), and Nowicki (*Mot. Galic.*, p. 42), the latter as late as 1865; but *cyllarus* has no lunate margin at all. At any rate it is clear that it is neither *P. icarus* nor *A. medon* (*astrarche*); I have a ♀ *hylas*, taken at Bérival in 1897, which exactly corresponds with the description (G.W.).

† This reference is open to question; there is a very strong tendency on the part of the older authors to refer it to *Aricia medon* (*astrarche*).

ii., p. 77, pl. xlvii., figs. 1, 2 (1779). **Candybus**, Bergs., "Nom.," ii., p. 78, pl. xlviii., figs. 1, 2 (1779). **Candiope**, Bergs., "Nom.," ii., p. 78, pl. xlviii., figs. 3, 4 (1779). **Candaon**, Bergs., "Nom.," iii., p. 3, pl. xlix., figs. 3, 4 (1779). **Oceanus**, Bergs., "Nom.," iii., p. 9, pl. liii., figs. 3, 4 (1779). **Coridon**, Esp., "Eur. Schmett.," i., pt. 2, p. 134, pl. lxxix. (cont. xxix.), fig. 1 (1779). **Fusciolus**, Geoff., "Fourer. Ent. Par.," p. 245 (1785). **Triton** (?), Fabr., "Mant. Ins.," ii., p. 74 (1787). **Adonis**, Fabr., "Mant. Ins.," ii., p. 75 *in part* (1787); Linn., "Sys. Nat.," 13th ed., i., pt. 5, p. 2349 (1788); Thnb., "Ins. Suec.," pt. 2, p. 39 (1791); Fabr., "Ent. Sys.," iii., pt. 1, p. 299 *in part* (1793). **Cebalus**, Hfmgg., "Ill. Mag.," iii., p. 185 (1803). **Dorylas**, Leach, "Edin. Ency.," ix., pt. 1, p. 129 (1815); Jermyn, "Butt. Coll. Vade-Mecum," 3rd ed., pp. 50, 115 (1826); Wood, "Ind. Ent.," p. 8, pl. iii., fig. 67 (1839). **Dorylus**, Sam., "Ent. Comp.," p. 242 (1819). **Labienus**, Jermyn, "Butt. Coll. Vade-Mecum," 1st ed., pp. 2, 36, 58 (1824); Humph. and Westd., "Brit. Butts.," p. 108 (1841). **Eros**, Stphs., "Illus. Haust.," i., p. 93 (1828); Wood, "Ind. Ent.," p. 8, pl. iii., fig. 70 (1839). **Icarinus**, Meig., "Eur. Schmett.," ii., p. 25, pl. xlviii., figs. 2 *a-b* (1830). **Iphis**, Meig., "Eur. Schmett.," ii., p. 25, pl. xlvii., figs. 5 *a-b* (1830). **Alexius**, Freyer, "Neu. Beitr.," vii., p. 133, pl. clxxvi., figs. 1-2 (1836). **Icarius**, Wood, "Ind. Ent.," p. 8, pl. iii., fig. 68 (1839); Mill., "Cat. Lép. Alp.-Mar.," p. 103 (1872). **Melanotoxa**, Marott, "Giorn. Sc. Nat. Pal.," xiv., p. 54, pl. v., fig. 14 *a-b* (1879).

ORIGINAL DESCRIPTION.—*Papilio, Plebeius, Ruralis icarus*. Röscl has figured this insect in his vol. iii., pl. xxxvii., figs. 3, 5; but only the ♂. The ♀ is dark brown on the upperside, and has a series of orange-yellow spots on the margin, found in some specimens on all four wings, in others only on the hindwings, in others scarcely visible at all; rarely, the ♀s have the wings almost wholly covered with blue. The underside of the ♀ is almost like that of the ♂, except that the ground colour is rather darker, but the ♀ is rather remarkable in being very variable on the underside, in some, many of the ocellated spots are united, sometimes forming curves, at other times long spots, or other figures; indeed, the ♀s of this species vary so much that one must be careful not to separate them into different species, nor to interchange them with other species. This species differs from *argus*, Linn., as follows: On the upperside the ♂ is much paler blue, almost semitransparent; on the underside this species does not exhibit the small shiny green metallic eyes on the margin of the hindwings, which Linné calls in his description of *argus*, "Ocellis cæruleo-argenteis." This butterfly is common, and appears in spring from May to the middle of June, and is found in gardens and meadows, but never in woods (von Rottemburg).

IMAGO.—25mm.-35mm. ♂. Bright lilac-blue, with the fringes white externally and grey internally. ♀ brownish-fuscos, sometimes scaled with blue, with an antemarginal row of orange lunules on all wings, the fringes grey or brownish. Underside ♂ pale grey, ♀ grey-brown or brown; with the basal, discoidal, submedian and marginal spots as in *Agriades thetis* and *A. coridon*.

SEXUAL DIMORPHISM.—The sexes show the usual difference in colour, the ♂s being uniformly blue, the ♀s brown, sometimes lightly, sometimes heavily, scaled with blue, with orange marginal spots. The underside also shows a distinct difference in colour, the ♂ usually blue- or silvery-grey, the ♀ dark grey or brown-grey. Of the ♂ scaling, Pierce writes (*in litt.*): The transparent scales are yellow, .003in. × .0015in., the apex barely rounded, *i.e.*, almost square; the dark scales are not plentiful, but have three apical points; the androconia are .001in. × .0005in., oval, with elongated ends, each scale with six rows of eleven spots. In the ♀ the transparent scales are yellow, .0035in. × .0015in., the apex sometimes irregularly three-lobed;

the darker scales are similar in size and shape, but are four-lobed. The underside scales are three-pointed. Aurivillius writes of the ♂ scaling of this species (*Bih. Svensk. Ak. Handl.*, v. p. 25): The androconia have 5-6 rows of dots running down them (see figs. 16-17); length with stem 0.06mm., without stem 0.054mm., width 0.026mm.; the hair-scales (fig. 18), which must not be confounded with the real hairs which thickly cover the base of the wing, are, as in the former species (*thetis*, Rott.), flattened, narrow, of even width, with broad base which does not end in a stem, but enters in the socket with its entire width; the length of these 0.24mm.-0.28mm., the greatest width 0.008mm. The hair-scales are found in the same rows as the androconia, but are larger and wider than they.

GYNANDROMORPHISM.—There are many gynandromorphs of this species recorded in various magazines, etc., the specimens themselves being mostly in well-known collections. It is difficult, however, to trace the older examples, and possibly others exist that have never been recorded. We have, however, unearthed enough to give some very interesting results, and have arranged them roughly so that somewhat similar forms follow each other:—

#### HALVED—FOREWINGS ♂, HINDWINGS ♀.

α.—Forewings ♂, hindwings ♀. C. S. Gregson coll. (Mosley, *Illus. Vars. Br. Lep.*, pt. 7, pl. iii., fig. 3). Now in the Webb coll.

#### HALVED—LEFT SIDE ♂, RIGHT SIDE ♀.

α.—Left side ♂, right side ♀. The antennæ similar. The right side ♀ with weak blue scaling on the inner margin of the hindwings; the left side ♂. The underside as in the corresponding sexes. The abdomen ♀, but scaled with blue above. In Mazzola's collection (Ochsenheimer, *Die Schmett.*, iv., p. 187; Rudolphi, *Abhandl. der Ak. Wiss. Berl.*, 1828, p. 51; Burm., *Handbch. der Ent.*, i., p. 339; Lefebvre, *Ann. Soc. Ent. Fr.*, 1835, p. 146). In the Vienna Museum (Schultz, *Ill. Woch. für Ent.*, i., p. 322; Rühl, *Pal. Gross-Schmett.*, i., p. 268), but Rühl erroneously says, "Right side ♂, left side ♀."

β.—Left side ♂, right side ♀. Captured near Coventry in June, 1833. [Recorded with the remark that Capt. Browne, in his book of *Butterflies*, mentions five or six similar ones.] (Clarke, *Field Nat. Mag.*, i., p. 229 with fig.; Schultz, *Illus. Woch. für Ent.*, i., p. 322).

γ.—Left side ♂, right side ♀. Mr. Pugh exhibited at the meeting of the Northern Entomological Society, on June 26th, 1858, a hermaphrodite *P. alexis*, taken by himself on the coast, the ♂ characters being shown on the left side of the body; the ♀ side remarkably well-developed, the red spots being very large upon both fore- and hindwings (*Zoologist*, xvi., p. 6190).

δ.—Left side ♂, right side ♀; right hindwing torn. The underside also showing sexual difference in coloration. Labelled in Zeller's handwriting "*Icarus hermaphroditus*. Zebe, lit. xii., '49." British Museum coll. (at present placed among the teratologicals) (Tutt).

ε.—Left side ♂, right side ♀, both wings and antennæ; on the left side the thorax and abdomen are blue, on the right side brown. Captured June, 1875, at Meulan, Seine-et-Oise, by Testelin. (Bellier, *Ann. Soc. Ent. Fr.*, 1875, p. xiv). We possess a specimen from the Bellier coll., left side ♂, right ♀, taken at Meulan (Oberthür, *Etudes*, xx., p. 23).

ζ.—Left side ♂, right side ♀. From the Boisduval coll. (Oberthür, *Etudes*, xx., p. 23).

η.—Left side ♂, right side ♀ (Heyne teste Schultz, *Ill. Woch. für Ent.*, iii., p. 103). Taken at Autun. Constant coll. (Oberthür, *Etudes*, xx., p. 23).

θ.—Left side ♂, right side ♀. Briggs' coll. Exhibited November 4th, 1875, by Mr. C. A. Briggs (*Ent. Mo. Mag.*, xii., p. 166; *Ent.*, xi., p. 101; Schultz, *Ill. Zeits. für Ent.*, iii., p. 103). Captured on the downs at Folkestone by T. Williamson, and given by him to C. A. Briggs. Sold at Stevens', October 22nd, 1896, for £3 5s., to Doncaster (Briggs, *in litt.*; *Ent. Rec.*, viii., p. 272).



ι.—Left side ♂, right side ♀; the red marginal spots on the ♀ side very distinct; the ♀ side smaller, and the wings rounder than on the ♂ side. Captured flying in a chalkpit at Arreton, Isle of Wight, June 6th, 1878 (Rose, *Ent.*, xi., p. 209).

κ.—Left side ♂, right side ♀; the latter brown, slightly suffused with blue towards base of forewing and base and anal half of hind-margin of hindwing, the submarginal spots only faintly indicated. Beneath, both sides nearly alike, except that, on the right side (♀), the submarginal orange spots are much more distinct than on the left (♂) side, especially on the forewings, and the lower basal spot and lower submedian spot are of the *arcuata* form. The body appears to be ♂ examined under a low power. Captured May 30th, 1873, on Darland Hill, near New Brompton, Kent, and is rather below the average size (J. J. Walker, *in litt.*).

λ.—Left wings ♂, right wings ♀; the left wings blue and larger than the right, which are brown, with yellowish-red marginal spots, and pale blue shading. The underside of the left wings typically ♂, of the right wings typically ♀. The right antenna wanting. Body in form and colour (blue-scaled) ♂, with distinct clasp. Obtained from Thuringia in 1895, through Strahler (Schultz, *Ent. Zeits. Guben*, xiii., p. 127).

μ.—Left wings ♂, both upper- and underside; the right wings ♀, the upper-side bright blue as in *ab. caerulea*, the orange lunules on this forewing being present but not clearly defined, whilst those of the hindwing are partly absent (Sabine, *Ent.*, xxx., p. 296).

ν.—Left side ♂, right side ♀, both wings and antennæ; body more like that of ♂ in appearance. Genitalia indistinct; captured 1896. In the Hartmann coll., Reichenbach (Schultz, *Woch. für Ent.*, ii., p. 365). Hartmann's collection is now (1910) dispersed (Gillmer).

ξ.—Hermaphrodite, exhibited by J. A. Clark, at the City of London Entomological Society's meeting, April 27th, 1897 (*Trans. City Lond. Ent. Soc.*, 1897, p. 17). Left side ♂, right side ♀. Abdomen apparently ♂. Captured Dover, July 7th, 1873 (Burrows, *in litt.*, September, 1907). Sold at Stevens', December 7th, 1909 (lot 143), for 18s., to Dr. T. A. Chapman.

ο.—Hermaphrodite, exhibited at the City of London Entomological Society's meeting, April 27th, 1897, by J. A. Clark (*Trans. City Lond. Ent. Soc.*, 1897, p. 17). Left side ♂, right side ♀; anal end apparently ♀. Captured at Eltham, July 10th, 1894 (Burrows, *in litt.*, September, 1907). Sold at Stevens', November 2nd, 1909 (lot 110), for 11s., to Pickett.

π.—Left side ♂, 12.5mm. along costa; right side ♀, 14.5mm. along costa; sharply divided, each side without a sign of the markings of the opposite sex. Locality unknown. Staudinger coll. (Bang-Haas, *in litt.*; Schultz, *Woch. für Ent.*, ii., p. 365).

ρ.—Left side ♂, right side ♀, both measuring 13mm. along the costa; each side sharply separated from the other. San Ildefonso, August, 1884. Staudinger coll. (Bang-Haas, *in litt.*; Schultz, *Woch. für Ent.*, ii., p. 365).

σ.—Left side ♂, right side ♀. The left side of the body (thorax and abdomen) velvety, whitish mixed with blue, the right side less velvety and brown; the two right wings slightly smaller than the left. Underside left wings pale grey, right wings brown-grey. Captured at Tramelan in the Bernese Jura. In coll. Geneva Museum (Blachier, *in litt.*).

τ.—Left side ♂, right side ♀. From Schönefeld of Leipzig. In the Royal Natural History Museum, Berlin (Schultz, *Berlin Ent. Zeits.*, 1904, p. 81).

υ.—Left side ♂, right side ♀. Captured by Balkowsky, near Kiev (Russia), between June 10th-23rd, 1904. In coll. Balkowsky (*Ent. Zeits. Guben*, xix., p. 156).

φ.—Left side ♂, right side ♀, Mason coll. Sold at Stevens', March 14th, 1905, for 18s. (*Ent.*, xxxviii., p. 114). Now in Keynes' coll. Both sides 14mm.; underside approaching *ab. arcuata* on ♂ side, normal on ♀ side; the genitalia appear somewhat abnormal, but the specimen is too old and dried to determine in what way. Labelled, when bought, "Edwin Shepherd" and "P. Bouchard, bought alive" (Keynes, *in litt.*, December, 1909).

χ.—Left side ♂, right side ♀. Briggs' coll. (*Ent.*, xi., p. 101). Taken at Dover by Chatwin, in 1874. Sold at Stevens', October 22nd, 1896, for £3 3s., to Maddison (Briggs, *in litt.*; *Ent. Rec.*, viii., p. 272). Left side ♂, right ♀, marked with blue; sold February 23rd, 1909, at Stevens', for £1 15s., to "Noakes," for Joicey (L. W. Newman, *in litt.*).

ψ.—Left side ♂, right side ♀. Briggs' coll. Captured with the preceding at Dover, by Chatwin, in 1874. Sold at Stevens', October 22nd, 1896, for £2 2s., to



Maddison (Briggs, *in litt.*; *Ent. Rec.*, viii., p. 272). Sold February 23rd, 1909, at Stevens', for £1 7s. 6d., to Newman, for the "Bright coll." (Newman, *in litt.*).

ω.—Left side ♂, right side ♀. Briggs' coll. (? *Ent.*, xi., p. 101): Sold October 22nd, 1896, to Capt. Vipan. This and the specimen s in the next section, together produced 18s. (T. H. Briggs, *in litt.*).

aa.—Left side ♂, right side ♀; small example. Dover, Webb coll. (Barrett, *Lep. Brit. Isles*, pl. xi., fig. 2c). [Mosley notes three in the "Webb coll.," and two in the "Bond coll." (*Illus. Vars. Brit. Lep.*, pt. vii., pl. iii.); and, as Webb now has the "Bond coll.," this makes five in his coll.; however, this and the example ρ in the next section are the only ones of them we find otherwise recorded.]

ββ.—Left side ♂, right side ♀, of a bright blue colour. Beverley, August, 1899. Maddison coll. Sold at Stevens', February 23rd, 1909, for £1 10s., to Janson (Chapman, *in litt.*).

γγ.—Left wings ♂, right wings ♀, labelled "Britain, Leech coll.," now in the British Museum coll. (Tutt).

δδ.—Left side ♂, right side ♀ (*Ent. Zeits. Guben*, 1895, p. 111).

εε.—Left side ♂, right side ♀. Captured by Oldaker, June 14th, 1902, on Ranmore Common (*Proc. Sth. Lond. Ent. Soc.*, 1902, p. 111); *Ent.*, xxxv., pp. 218, 324, 327; xxxix., p. 158).

ζζ.—Left side ♂, right side ♀ (Hudson, *Proc. Ent. Soc. Lond.*, 1854, p. 24).

### HALVED—RIGHT SIDE ♂, LEFT SIDE ♀.

α.—Right side ♂, left side ♀. The body also divided longitudinally, the shoulders, particularly, are strikingly dissimilar. The right wings above are of a beautiful violet, on the left of a dark brown with weak fulvous lunules; the sexual colour-difference is also noticeable on the underside, and the ♀ wings are more strongly ocellated than those of the ♂. No perceptible differences in the legs, antennæ, or palpi were noticed, and the drying of the specimen did not allow a proper examination of the sexual organs, although, with the aid of a strong lens, one was able to see on the ♂ side one of the "clasps" of the ♂ organ. Taken June, 1834, at Ste. Marie-aux-Mines in the Haut-Rhin, by Dr. Schreiner (Lefebvre, *Ann. Soc. Ent. Fr.*, 1835, p. 145, pl. ii., fig. 4; Silberm., *Revue*, i., p. 50; Rühl, *Pat. Gross-Schmett.*, p. 268; Schultz, *Ill. Woch. für Ent.*, i., p. 322).

β.—Right side ♂, left side ♀. Of rather small size, and in poor condition. [Now labelled "*Polyommatus thestylis*, Jerm. (? by South who arranged the cabinet), but nothing to do with *thestylis*.] British Museum coll. (Tutt).

γ.—Right side ♂, left side ♀ (*Ent.*, xi., p. 101). Of very fair size and in good condition; the ♀ side well marked with orange. The colour of the underside as distinctly marked sexually as the upperside. From the Sam Stevens' coll. Transferred to the British Museum coll., 1900, at the sale of the latter coll. (Tutt). Sold at "Stevens' sale rooms," March 27th, 1900, for £3 (*Ent. Rec.*, xii., p. 111).

δ.—Right side ♂, purplish-blue above, bluish-grey beneath; left side ♀, dingy-brown, shaded with blue, and with six crescent-shaped orange spots on each wing, parallel with the hind margin, the underside brownish-grey. Captured near Manchester, August, 1868 (Thorpe, *Ent.*, iv., p. 132).

ε.—Right side ♂, left side ♀. The wings on the right side sensibly larger than those on the left (contrary to the specimen figured by Lefebvre, *Ann. Soc. Ent. Fr.*, 1835, pl. i., fig. B<sub>4</sub>). Captured by Dillon, near Tonnerre. In the Paris Museum (Lucas, *Ann. Soc. Ent. Fr.*, 1868, p. 744).

ζ.—Right side ♂, left side ♀, the abdomen divided. Captured at Amboise, May 25th, 1874 (Lelièvre, *Pet. Nouv. Ent.*, i., p. 409).

η.—Right side ♂, left side ♀, the two sides showing well the sexual differences. Captured near Horley, September 1st, 1875. In coll. Murray, Aston (Matthews, *Ent. Mo. Mag.*, xii., p. 111; *Ent.*, viii., p. 238; Schultz, *Ill. Zeits. für Ent.*, iii., pp. 102-3).

θ.—One side bright blue with all the characters of the ♂, the other side brown, with all the characters of the ♀. Taken at Deptford. A similar example was figured, *Ann. Soc. Ent. France*, 1835, p. 145, pl. i., fig. 44 (E.N.D., *Ent. Mag.*, iii., p. 304).

ι.—Right side ♂, left side ♀. Captured at Dover by Bayley, 1879. Sold October 22nd, 1896, at Stevens', to Sheldon (with next example) for 8s. (Briggs, *in litt.*, and *Ent. Rec.*, viii., p. 272); now (1910) in the Sheldon coll. (Sheldon, *in litt.*).

κ.—Right side ♂, left side ♀. "Jenner coll." Sold with the Briggs' coll., October 22nd, 1896, to Sheldon (with the preceding example) for 8s. (Briggs

in *litt.*, and *Ent. Rec.*, viii., p. 272); now in the Sheldon coll. (Sheldon, in *litt.*).

λ.—Right wings ♂, left wings ♀, brown and spotted as in the ordinary ♀. Captured June 22nd, 1889, at Keyingham, in south-west Yorkshire (Boulton, *Ent.*, xxi., p. 211; *Proc. Ent. Soc. Lond.*, 1889, p. xlvii).

μ.—Right wings ♂, left wings ♀. Captured by Chatwin, at Dover, in 1887. Sold with the Briggs' coll. to Sheldon, for £1 15s., at Stevens', on October 22nd, 1896 (Briggs, in *litt.*). Now in the Sheldon coll. (Sheldon, in *litt.*, and *Ent. Rec.*, viii., p. 272). Webb notes (*Ent.*, xxi., p. 133) that a hermaphrodite, captured at Dover in 1887, had been brought under his notice; no doubt this specimen.

ν.—Right side ♂, left side ♀; body on the right side also of ♂, on the left side of ♀, coloration; the genitalia on the left ♀, whilst on the right side a clasp is developed. In the possession of Hyckel-Ratibor (Schultz, *Woch. für Ent.*, iii., p. 103).

ξ.—Hermaphrodite, exhibited City of London Entomological Society's meeting, held April 27th, 1897, by J. A. Clark (*Trans. City Lond. Ent. Soc.*, 1897, p. 17). Right side ♂, left side ♀, anal end apparently ♂. Captured in Epping Forest, 1892. Clark coll. (Burrows, in *litt.*, September, 1907). Sold at Stevens', November 2nd, 1909 (lot 109), for 13s., to Janson.

ο.—Right side ♂, left side ♀. Noted in Ribbe's "Price List of Lepidoptera," no. 14, 1902-3 (Schultz, *Berl. Ent. Zeits.*, 1904, p. 81). No hint as to the collection it ultimately reached.

π.—Right side ♂, left side ♀. "Mason coll."; sold at Stevens' (lot 105), March 14th, 1905, for 16s., to J. A. Clark (*Ent.*, xxxviii., p. 114). Sold again at Stevens' December 7th, 1909, for 15s., to Dr. T. A. Chapman (Chapman, in *litt.*).

ρ.—Right side ♂, left side ♀, large specimen; left forewing of the blue-scaled ♀ form, from Dover. Webb coll. (Barrett, *Lep. Brit. Isles*, pl. xi., fig. 2f).

σ.—Right side ♂, left side ♀. Briggs' coll. (*Ent.*, xi., p. 101). Sold at Stevens', October 22nd, 1896, to Capt. Vipan (Briggs, in *litt.*; *Ent. Rec.*, viii., p. 272).

τ.—Right side ♂, left side ♀. Taken by F. Stansell, Taunton, August 15th, 1880. Maddison coll. Bought at Stevens', February 23rd, 1909, for £2, by Newman, for the "Bright coll." (L. W. Newman, in *litt.*).

υ.—Right side ♂, left side ♀. Taken on Wandsworth Common in 1860, by Wellman, was sold at Stevens', in 1894, for £2 14s., to R. Adkin (*Ent.*, 1894, p. 244; and R. Adkin, in *litt.*).

φ.—Right side ♂, left side ♀. Captured in Hainault Forest, 1852 (Sheppard, *Proc. Ent. Soc. Lond.*, 1852, p. 34).

#### HALVED—BUT UNRECORDED AS TO WHICH SIDE IS ♂ AND WHICH ♀.

α.—The wings on one side ♂, those on the other ♀, the characteristic markings of each sex being very distinct. Captured September 5th, 1868, at Westwood, near Scarborough (Rowntree, *Entom.*, iv., p. 147).

β.—A hermaphrodite, rather worn, taken August 21st, 1880, near Eastbourne (Dewey, *Ent.*, xiii., p. 240; *Trans. City Lond. Ent. Soc.*, 1893, p. 49; Rühl, *Pal. Gross-Schmett.*, p. 760; Schultz, *Illus. Zeits. für Ent.*, iii., p. 103).

γ.—A hermaphrodite taken near Sturton, North Notts, August, 1881 (Gibbs, *Ent.*, xv., p. 89).

δ.—A specimen with the ♂ and ♀ clearly represented on the opposite pairs of wings (Edgell, *Ent.*, xx., p. 302).

ε.—A fine hermaphrodite. Captured August, 1877, at Hastings, on a small waste slip of land nearly two miles from the sea (Sotheby, *Ent.*, x., p. 253).

ζ.—A gynandromorph sold at Stevens', November 23rd, 1897, for 20s., from the Hodgkinson coll. (no details forthcoming) (*Ent. Rec.*, ix., p. 336).

#### NOT ABSOLUTELY HALVED LONGITUDINALLY.

α.—Right side ♂, left side ♀. The left hindwing with a costal band of ♂ colour, wider on the outer margin than at the base. Moderate size, poor condition (the right hindwing torn). [Now (January, 1910) labelled "*Polyommatus thestylis*, Jerm.," ? by South, who arranged the cabinet, but certainly nothing to do with *thestylis*.] British Museum coll. (Tutt) (Lefebvre, *Ann. Soc. Ent. Fr.*, 1835, p. 146; Schultz, *Ill. Woch. für Ent.*, i., p. 322).

β.—Right side ♂, left side ♀. The left forewing and left hindwing both with a costal band of ♂ colour, on the hindwing not reaching to the apex. Of rather large size. This specimen is figured by Humphreys and Westwood (*Brit. Butts.*,

pl. xxxiv., fig. 11\*), the blue on the margin overdone. British Museum coll. (Tutt) (Lefebvre, *Ann. Soc. Ent. Fr.*, 1835, p. 146; Schultz, *Ill. Woch. für Ent.*, i., p. 322).

γ.—Right side ♂, left side ♀, the latter rather shot with blue, and with a small wedge-shaped, lavender-coloured streak, extending partly across the hindwing. Captured on the downs near Winchester, August 23rd, 1879 (Weston, *Ent.*, xii., p. 58).

δ.—Right wings ♂, the left wings ♀, except that the right forewing has a narrow dark band, reaching from the tip to the base of the anterior wing, and a similar band along the upper edge of the right hindwing, with one indistinct red spot; the right antenna longer than the left. Captured June 10th, 1888, on the downs near Brighton (Brazenor, *Ent.*, xxi., p. 185).

ε.—Right side ♀, left side ♂, except that each wing on the left side has a stripe of the ♀ colouring (Lang, *Proc. Ent. Soc. Lond.*, 1881, p. x).

ζ.—Right side ♀, with fulvous lunules; left forewing blue, except a longitudinal band of brown colour, commencing at the base and reaching almost to the fringe, and at the end of which are two orange lunules (really only one and a half); left hindwing blue in its upper half, brown with orange lunules in its lower half (nervure 4 marks the separation of the two colours); the body is covered with blue scales on the left side, brown on the right. Captured at Arcine, at the foot of Mt. Vuache (Haute-Savoie), June 20th, 1909. Blachier coll. To be figured *Bull. Soc. Léop. Genève*, ii., pl. i., fig. 2 (Blachier, *in litt.*).

η.—Left side ♂, right side ♀, but the right forewing has an irregular blotch of ♂ colouring on its lower half. Dover, July or August, 1878. Mosley, in his *Illus. Vars. Brit. Lep.*, no. 7, pl. iii., fig. 2, has wrongly recorded "1877" for "1878," as also in the *Nat. Journal*, 1896, pl. iii., fig. 15; but both these plates make the outlines of the sex portions of the right forewing too distinct (T. H. Briggs, *in litt.*, 20. i. 1910).

θ.—Left side ♂, right side ♀, except for a large triangular patch extending from the base and inner margin to the outer margin, and occupying almost two-thirds of the right hindwing. Boisduval coll. Figured by Oberthür (*Etudes*, xx., pl. iv., fig. 47).

#### SEXUAL COLORATION IRREGULARLY MIXED.

α.—Left side ♀, the costal margins of right fore- and hindwings with a blue band along the costal margins of each, 3mm. broad. The left underside brown-grey (♀), the right underside blue-grey (♂). The right wings 1mm. longer than the left. The submedian series of ocellated spots, and the orange marginal band, more strongly developed on the left side than on the right, but the basal areas of the right side much bluer than the left. Captured near Gera. In coll. R. Dieroff (Gillmer, *Ent. Zeits. Guben*, xix., p. 157).

β.—Preponderantly ♀. Right wings ♀, though pervaded by the blue coloration of the ♂; left wings purely ♀. Antennæ, body, and genitalia ♀. In coll. Hartmann, Reichenbach (Schultz, *Woch. für Ent.*, ii., p. 365). The Hartmann coll. is now (1910) distributed (Gillmer).

γ.—Right forewing ♂, except for the median nervure and its branches, which are brown with two orange spots at their termination; the right hindwing with the costal margin to the disc ♂, the outer and inner margins ♀; the left forewing, basal area to disc ♂, hindwing with a streak of blue from base to middle of outer margin; other parts ♀ (Tutt). Sent by Capt. Ver-Huell, of Arnheim (Gerhard, *Mon.*, p. 19, pl. xxxv., fig. 2; Schultz, *Woch. für Ent.*, ii., p. 356).

δ.—Preponderantly ♂. All the wings, especially the right, irregularly mixed with the brown colour of the ♀. The right forewing larger (15mm.) than the left (14mm.). Found near Berlin. In coll. Wiskott, Breslau (Wiskott, *Lep. Zwitter*, p. 12; Schultz, "*Woch. für Ent.*," ii., p. 365).

ε.—Apparently ♀, with streaks of blue on all the wings. Slemschöran, Bohemia. Staudinger coll. (Bang-Haas, *in litt.*, teste Dadd; Schultz, *Woch. für Ent.*, ii., p. 365).

ς.—Gynandromorphous specimen, near Whitley, August, 1877. Maddison

\* In the description of this plate, Humphreys and Westwood note that, at the time they were writing (1840), there were "three other hermaphrodite specimens" of *P. alexis* in the British Museum coll. besides the one being figured, i.e., four altogether. At the present time (January, 1910) only three can be found. Two others, one from the "Zeller," the other from the "Sam Stevens" collections, are comparatively modern importations.

coll. Sold at Stevens', February 23rd, 1909, for £1 6s., to Noakes for the Joicey coll. ? (Newman, *in litt.*)

η.—Gynandromorphous, the colour of the two sexes mixed in the wings. Captured Folkestone, 1890, by Austin. Briggs' coll. Sold October 22nd, 1896, at Stevens' to Christy, for £1 6s. (Briggs, *in litt.*; *Ent. Rec.*, viii., p. 272).

θ.—The right forewing chiefly ♂, with a streak of ♀ colour from the base to the middle of the outer margin, where it expands and encloses two orange marginal spots; the right hindwing almost divided in two by a line from the base to the middle of the outer margin; the costal half chiefly ♂, the inner marginal half ♀. The left wings are ordinary ♀, with no blue scaling. Captured Dorking, August 12th, 1900 (Buckstone, *in litt.* and *Proc. South Lond. Ent. Soc.*, 1900, p. 103).

TERATOLOGICAL EXAMPLES.—There must be a considerable number of teratological specimens of *P. icarus* in various collections, although comparatively few have been recorded. Stephens (quoted by Humphreys and Westwood) states that difference in form is not unusual in this species, some ♀s particularly having the anterior wings much more rounded at the tip, whilst, in others, they are somewhat acute. Examples in our own series show also a marked difference in this respect, many ♂s as well as ♀s having the forewings markedly truncate at the apex; so much is this so that, unless very specially developed, there seems no purpose in separately noting them. Tunaley mentions (*Proc. Sth. Lond. Ent. Soc.*, 1895, p. 63) that one *P. icarus* taken that year at Freshwater showed a tendency to angularity in the hindwings. The following are the only teratological examples of which we have more detailed notes:—

α.—An interesting example with five wings, three on the left side; sent by Korb from Küleck, Asia Minor, 1885. Staudinger coll. (Bang-Haas *in litt.* with rough sketch *teste* Dadd; Rühl, *Pfl. Gross-Schmett.*, p. 760).

β.—♂. Right forewing markedly smaller than the left; the right hindwing still much smaller proportionally; spotting of small wings normal. Cuxton, 20. vi. '93. Tutt coll.

γ.—♂. Right hindwing crumpled, very much narrowed, and not above a third the size of the left hindwing. Ollon, 11. v. '03. Tutt coll.

δ.—♀. Left forewing much narrowed, the anal angle rounded so that the outer and inner margins form a continuous curve; the left hindwing somewhat smaller than right hindwing, the inner margin considerably excised; spotting of smaller wings normal. Sligo, 1891. Tutt coll.

ε.—♂. The left forewing very much narrower than the right, especially from the discoidal cell outwards; a pallid area in the discoidal of both left fore- and hindwing suggests injury, and consequent cause of narrowing of forewing, although the left hindwing is of normal size. Malta, 14. vi. '02. T. B. Fletcher coll.

ζ.—♂. Normal size. The left forewing contracted near the outer margin; the inner margin much shorter than usual, thus narrowing the wing very markedly towards the anal angle; the underside of the hindwing of the obsolete or *semi-persica* form. Grésy-sur-Aix, 23. viii. '97. Tutt coll.

η.—♂. Average size. The left hindwing curled up, and only about one-third normal size. Albarracin, 28. vii. '01 (Chapman). Tutt coll.

θ.—♂. Normal size. The left forewing slightly shorter and broader than the right. Allos, 11. viii. '06. Tutt coll.

ι.—♀. Right forewing rounded at apex, otherwise normal. Abriès, viii. '00. Tutt coll.

κ.—♂. Truncate at apex of left forewing. Bourg St. Maurice, 1. viii. '05. Tutt coll.

λ.—Exactly similar ♂ specimen. Clelles, 3. viii. '06. Tutt coll.

μ.—♂. Forewings of almost normal size, but slightly concave on costa; the hindwings much smaller than usual, although apparently not crippled. Labelled "*Proc. Sth. L. Ent. and N. H. Soc.*, 1887, pl. ii., fig. 3." Brit. Mus. coll. Reference to this figure shows it to be of the *postico-obsoleta* form, whilst a further reference to p. 62 shows that it was captured at Ventnor (Tutt).

ν.—♂. The left fore- and hindwing both cut out concavely on the outer margin. "Ventnor." Brit. Mus. coll. (Tutt). The left fore- and hindwing reduced to about three-fourths natural size, the forewing with the termen excised

from vein 5 to tornus, the hindwing with the termen excised from vein 4 to the tornus. Ventnor, June, 1887 (South) (Hampson, *Ent. Mo. Mag.*, xxxvii., p. 120).

ξ.—♂. Forewings with sharply concave outline from the apex to the lower half of the outer margin. Folkestone. Brit. Mus. coll. (placed among the teratologicals) (Tutt).

ο.—♂. Right forewing with the apical area truncate, the termen excised below apex; the right hindwing somewhat reduced, the termen excised between veins 7 and 2, and the inner margin truncate towards tornus. Folkestone (South). Brit. Mus. coll. (Hampson, *Ent. Mo. Mag.*, xxxvii., p. 119).

π.—♂. Very small. The left forewing hollowed out just below apex. "Valais (Anderegg); Frey coll." Brit. Mus. coll.

ρ.—♂. Normal size. The lower half of the outer margin of left forewing cut back a little concavely just above the anal angle. Between Saas-Grund and Balen, 7. viii. '04. Tutt coll.

σ.—♂. Large size. Almost like the last, but with the concavity (which is in exactly the same position in the left forewing) even less marked. Between Saas-Grund and Mattmark, 6. viii. '04. Tutt coll.

τ.—♀. Brown form. The right forewing concave in the lower half of the outer margin. Brit. Mus. coll.

υ.—♂. Normal size. A sharply-angulated notch, normally scaled, in the middle of the outer margin of the right forewing. Useigne, August, 1899. Tutt coll.

φ.—♂. Left forewing with a notch towards the centre of the outer margin; the anal angle bulging and rounded. Captured by Chapman at Larche, 28. vii. '05. Tutt coll.

χ.—♂. Normal size. Outer margin of left forewing with tiny notch in centre; the outer marginal line quite straight from apex to notch, and almost so from notch to anal angle. Au Pra, August, 1901. Tutt coll.

ψ.—♂. The outer margin of the left forewing notched just above the anal angle. The Brévent, August, 1902. Tutt coll.

ω.—♂. Normal size. Left forewing slightly concave on inner margin near centre; apparently, also, a slight injury on costa of left hindwing directly below this. Susa, August, 1897. Tutt coll.

αα.—♀. The left forewing with the apex ill-pigmented, and with a small piece torn out of the apical margin (where the membrane appears to be very weak); a largish round hole in the same wing just outside the discoidal lunule. British Museum coll. (Tutt). Left forewing reduced to about three-fourths natural size; a large hole in end of cell; the discocellulars carried out round it, and the veins distorted. Kent (South) (Hampson, *Ent. Mo. Mag.*, xxxvii., p. 120).

ββ.—The right pair of wings very narrowed and the right hindwing shortened, the left pair of wings normal. Both forewings on the underside with the submedian series of spots joined to the black chevrons and forming well-marked black streaks (= *antico-striata*). Dale coll. Hope Museum, Oxford (Tutt).

γγ.—♀. Of lilac-blue colour, with the outer margin slightly hollowed concavely on all four wings. Great Melton, Norfolk, 4. ix. 1902. Raynor coll.

**PATHOLOGICAL EXAMPLES.**—There are comparatively few specimens whose wings show a partial failure in the development of the pigment recorded. Such peculiarity is occasionally combined with a modification in wing-form, etc., as already indicated in ε, αα, etc., of the preceding section. The following are all that have come under our notice—

α.—♂. Hindwings very pale, bluish; forewings of normal colour, Tintern. August 8th, 1904 (Bird, *Ent. Rec.*, xvii., p. 311).

β.—♂. The disc of all wings pale blue, the outer-marginal area pale brownish; the spots from the underside showing through on all wings as a double row of pale dots parallel with the outer margin; the orange lunules at anal angle of hindwings, and the basal spots also, all showing through from the underside (Mosley, *Illus. Vars. Brit. Lep.*, pt. vii., pl. iii., fig. 5). (= *ab. transparens*)

γ.—♂. The left fore- and hindwing each with a pallid, whitish, triangular patch extending from outer margin to discoidal cell. No doubt these areas were situated directly under each other when in the pupal state. The right wings normal. Deal, August, 1887. Tutt coll.

δ.—♂. The left hindwing completely bleached. Folkestone, 1896 (Carpenter, *Proc. South Lond. Ent. Soc.*, 1896, p. 60; *Ent. Rec.*, viii., p. 249).

ε.—♂. Normal size. A fair-sized pallid patch towards the middle of the outer margin of the right forewing. Pont du Gard, May 9th, 1905. Tutt coll.





1



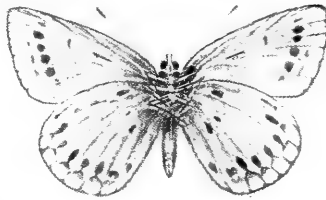
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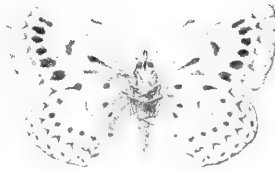
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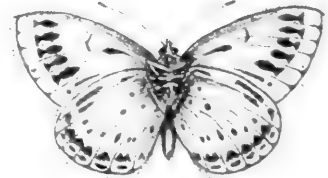
16



5



11



17



6



12



18

POLYOMMATUS ICARUS VARS.

*A Natural History of the British Butterflies, etc., 1914.*

(To face p. 123.)

EXPLANATION OF PLATE XI.

POLYOMMATUS ICARUS.

- |                                     |                                   |
|-------------------------------------|-----------------------------------|
| 1, ♂, upperside.                    | 10, ab. <i>transiens</i> .        |
| 2, ♀, „                             | 11, ab. <i>elongata</i> .         |
| 3, ♀, ab. <i>supracerulea</i> .     | 12, ab. <i>antico-striata</i> . * |
| 4, ♂, underside.                    | 13, ab. <i>striata</i> .          |
| 5, ♀, ab. <i>crassipuncta</i> .     | 14, ab. <i>striata-elongata</i> . |
| 6, ♀, underside.                    | 15, ab. <i>transiens</i> .        |
| 7, ab. <i>postico-obsolata</i> .    | 16, ab. <i>subtus-radiata</i> .   |
| 8, ab. <i>subobsolata-extensa</i> . | 17, „                             |
| 9, ab. <i>obsolata</i> .            | 18, ab. <i>melanotoxa</i> .       |





ζ-η.—Two ♂s with the wings partly white, from Portsdown (Pearce, *Ent.*, xxiii., p. 230).

θ.—A large bleached blotch at the anal angle of the left forewing. Sex unnoticed (Kemp, *Proc. Sth. Lond. Ent. Soc.*, 1900, p. 78).

ι.—♀ of very blue type. The outer half of the right fore- and hindwing pallid and scaleless. Both these wings also crippled, the pallid areas showing through on the underside. British Museum coll.

κ.—♀. Right hindwing pallid, apparently almost scaleless; the pallid area extending over the whole wing from the outer marginal line, except the extreme base of the wing. Deal, August, 1887. Tutt coll.

λ.—♀. The left forewing streaked with pale longitudinally, one streak extending from the base to outer margin directly under the discoidal lunule, another long one parallel to the inner margin ending widely at anal angle, several shorter ones between these; the pale area appears to be scaleless. The other three wings normal. Deal, August, 1887. Tutt coll.

μ.—♀ of the blue form; the forewings splashed with streaks of white (Garland, *Ent. Rec.*, viii., p. 249).

ν.—♀. Left forewing truncate from apex to middle of outer margin; a pale patch just above the anal angle making the orange lunule in the patch whitish. Pfynewald, May 14th, 1903. Tutt coll.

ξ.—♀ without a trace of blue (the only one taken among a large number plentifully supplied with blue scales); the hind-marginal markings on left forewing pale ochreous, instead of orange as on the other three wings. Between Oxted and Chipstead, June, 1909 (South, *Proc. Sth. Lond. Ent. Soc.*, 1909-10, p. 106).

ο.—♀. With analogous pallid patches on the right fore- and hindwing, occupying a large patch extending from outer margin to discoidal cell. The whole of these areas upper- and underside bleached, and edges torn. The pallid areas grey, with slight brownish tinge, marginal pattern present, but nearly colourless, the marginal spots grey, the crescents pale buff, the chevrons grey. Hodgson coll. (*in litt.*).

π.—♀. With a bleached hindwing. Folkestone, June, 1902 (Browne, *Proc. South Lond. Ent. Soc.*, 1903, p. 73).

ρ.—♀. Entirely pale golden-brown, of the colour of *Coenonympha pamphilus*, Webb coll. (Barr., *Brit. Lep.*, i., p. 79).

VARIATION.—The variation of this species, as might be expected from its wide range of distribution, and its tendency to many-broodedness, is most interesting, yet, in Europe, the development of local races is not very definite, nor is its seasonal variation really very marked, except that the summer and autumn broods, in hot seasons, tend sometimes locally to smaller size and a lack of brilliancy in colour. The Asiatic local forms are rather more distinctive, and several races have been named. Among the largest and most brilliantly coloured of the races of this species, is our own western European form (= var. *clara*), which reaches its maximum of size and beauty in both sexes in Scandinavia, on the west coast of Ireland, and in Scotland; the underside spotting, however, in this race, tends, locally, to show a strong leaning to the obsolete forms. Some authors, Zeller, Gillmer, etc., have suggested a wide-spread general difference between the spring (*vernalis*) and summer (*aestivalis*) broods, but, though this differentiation might fairly be made as between the spring and summer broods of Mauretania and the hotter parts of southern Europe, Syria, etc., it fails almost entirely in western France and Great Britain, and in many other parts of the range of the species, where the examples of both sexes are usually as large in the summer, as in the spring, brood, equally bright in colour, and the ♀s as plentifully and brilliantly covered with blue scales, yet, in exceptionally hot seasons, and locally, a noticeable difference may be found, but not to the extent sometimes suggested. Zeller, as noted above, was the first lepidopterist to suggest (*Isis*, 1847, p. 154) separate *vernalis* and *aestivalis* facies in the species, and, as his data were largely obtained

from Italian (including Sicilian), Syrian, and Asia Minor, material, compared with his knowledge of the species in Germany, he had fair grounds for the suggestion. Gillmer also indicates (*Int. Ent. Zeits. Gub.*, ii., p. 1) a similar seasonal difference, noting particularly that the ♀s have more blue scaling on the upperside of the wings in spring, the summer examples wanting this more or less, the blue scales being sometimes entirely absent. This is the main feature on which the supposed difference in the seasonal forms is based, and is, as noted above, only partially accurate when one considers the species throughout its whole range, *e.g.*, Siepi states (*Cat. Léop. Bouches-du-Rhône*, p. 39) that the ♀ ab. *caerulea* is often met with throughout the Bouches-du-Rhône district, particularly in the second brood, whilst, as noted above, in Britain, where the blue ♀s are much more abundant than elsewhere, it often happens that one may capture, in the summer brood, in August and September, scarcely a single brown ♀, all being more or less strongly scaled with blue and identical with the spring examples. Oberthür indicates (*Etudes*, xx., p. 23) that the blue ♀s are more abundant in certain countries and districts, *e.g.*, in England, he says, they are often of a pale but bright blue with a very special facies; in Brittany, he adds, the ♀s are sometimes blue, but then the tint is darker than in the English race, but he avers that the most beautiful blue form comes from Algeria and has the red-spotted margin very wide. That the blue form of the ♀ occurs sometimes very locally is indicated in a report by Adkin, who states (*Proc. South Lond. Ent. Soc.*, 1890-1, p. 170) that the majority of the ♀s observed at Eastbourne in August, 1891, were brownish, although, in one old disused chalkpit, those scaled with blue were more numerous; whilst we ourselves note that, in August, 1887, when the species was most abundant at Deal, almost all the specimens were more or less scaled with blue, but the ♀s taken in September, 1907, at Cuxton, hardly showed any scaled heavily with blue, yet Hodgson observes (*Ent. Rec.*, xix., p. 305) that the specimens taken in Surrey and Sussex earlier in the season showed an unusually large proportion of blue. As contrasting with the brown autumnal examples taken at Cuxton in the autumn of 1907, and agreeing with the blue ♀s taken at Deal in 1887, it is noted (*Ent. Rec.*, xxi., p. 227) that, at Folkestone, in September, 1909, when the species again was exceedingly abundant almost all the ♀s were blue-scaled and we find recorded a variety of different forms captured. These are noted as—

- (1) Entirely lilac-blue, with red marginal spots.
- (2) Rather darker blue, with red marginal spots, pale blue arches above orange lunules of hindwings, and pale spots to complete usual row of orange lunules near apex of forewings.
- (3) Blue-tinged, with pale discoidal spots on forewings, and pale arches and pale discoidal spots on hindwings.
- (4) Purple-blue limited to basal and median areas of wings.
- (5) Entirely brown, except for faint basal tinge of blue and orange marginal lunules on all wings.

South also notes (*Proc. South Lond. Ent. Soc.*, 1909-10, pp. 106-7) that, in June, 1909, on the North Downs, between Chipstead and Oxted, all the ♀s (but one) observed, were more or less scaled with blue, and, of sixteen picked examples, he notes further that—

- (1) Not a single specimen was found wholly free of orange lunules or spots, though one or two came near having them entirely absent.

(2) Four had the orange lunules on all wings well-developed.

(3) The greater number of those inspected were brown, with the basal area of each very blue or sprinkled with blue scales.

(4) One without a trace of blue (see *suprà*).

(5) Grey-blue ♀; forewings with four orange lunules inwardly edged with black (the first of the series very small); above the orange lunules, the inter-nervular spaces clouded with greyish-white; the outer marginal area limited by a greyish-white line; similarly, the outer marginal area of the hindwing limited by a greyish-white serrated line, on which are four orange lunules as on forewings, and a series of black dots, the latter almost entirely encircled with greyish-white.

(6) Almost black; the basal half of all the wings thickly sprinkled with deep blue scales; a few outer marginal orange lunules; the black marginal spots are large and encircled with blue, except those under the orange lunules.

(7) Similar, but the blue colour on forewing continued along nervules, so that the blackish ground colour is cut up into black patches.

(8) Almost entirely blue, but with blackish cuneiform patches between nervules on hindwings; on forewings the black edges of the rather obscure orange marks slightly produced inwards, and, therefore, wedge-like in shape.

Reuss describes (*Ent. Rec.*, xxi., p. 211) a ♀, taken at Munden, in Herts, in May, 1909, light blue, costa whitish, the blackish marginal lunules edged with bluish-white, instead of orange; the hindwings with the marginal lunules scarcely edged with orange except the one at the anal angle, which is more strongly marked. He further notes (*op. cit.*, p. 236) another ♀, violet-blue in colour, with large black spots on the margin of the hindwing, but only a cloudy trace of the usual red and black markings, the forewings with a rusty shade edging the black margin, but no red spots; taken also at Munden, in September, 1909. Dalglish observes that, in July, 1894, on the coast slopes at Stonehaven, the ♀s were very variable, one almost as blue as the ♂s, the discal spot on the anterior wing surrounded with white, three of the cellules at the tip of the wing having dashes of white, whilst others, on the other hand, are almost as dark as *Aricia* var. *artaxerxes*, with only a very slight suffusion on them. T. B. Fletcher notes (*in litt.*) that, at Rame Head, in Cornwall, in early June, 1904, the ♀s were very blue. Mathew compares (*in litt.*) the Irish and English specimens, and states that, in 1886, at Berehaven, Co. Cork, he obtained some remarkably handsome forms of the ♀s of this species, considerably larger than Devon and Essex examples, with nearly the whole of the wings suffused with blue, the orange marginal spots very large and bright, forming a conspicuous band. Near Harwich, in August, 1904, he adds, a ♀ was captured very brightly suffused with lilac-blue, with whitish apical blotches on the forewings, and a conspicuous marginal series of round black spots, slightly bordered above with orange on the hindwings, whilst, in August, 1905, another ♀ was taken with the disc of the forewings shot with blue, the costa and hindmargin broadly sooty-black, and with the faintest perceptible indication of orange markings showing through, the discoidal spot very large and black; the hindwings broadly sooty-black on costa and the upper half of hindmargin, the disc blue, dusted with black atoms; the marginal spots small, black, edged above with orange. A ♀ from Charlbury, Oxfordshire, he says, is of a bright lilac-blue, with broad black margin to forewings, and three black blotches towards the inner angle, the hindwings lilac-blue, with four or five black marginal spots, but with no trace of orange, and another, somewhat similar, taken at St. Osyth, only with faint traces of orange above the black hindmarginal spots on hindwings. Tyrer mentions

(*Ent. Rec.*, ii., p. 111) the capture of a bright blue ♀, the discal area shading off to a deep chocolate border, at Queendown Warren, near Chatham, in early June, 1891, whilst Thompson mentions (*Ent. Rec.*, vi., p. 120) a Sligo ♀, taken in 1895, with a series of pale blue crescents on the inner edge of the orange spots of the hindwings. Grover notes (*Ent. Rec.*, ix., p. 312) that, at Guildford, the ♀s usually have the base more or less lilac-blue, but the amount varies from a few scales to others in which it covers half the wing. Bird observes (*Ent. Rec.*, xvii., p. 311) that the ♀s at Tintern appear to be much bluer than those taken near London and in West Sussex. Barrett states (*Brit. Lep.*, i., p. 79) that, "in southern English localities, the species is sometimes found of a dull brown colour, without a trace of blue on the upperside, though, more frequently, a few blue scales appear near the base, or, in increasing numbers, until the middle is tinged with blue; in the eastern counties, the brown colour is often much darker, the blue suffusion consequently appearing brighter; northward and westward the proportion of blue seems to increase, until, in the north and west of Ireland, the upperside in this sex is ordinarily of a brilliant glossy blue, except at the margins, which are nearly always more or less dark brown, broken by the orange spots, which, in many of these specimens, are large and brilliant, and often by white dashes between, or by white borders on both the inside and outside of, the orange spots; not infrequently, such specimens have white dashes in the blue towards the apex, or white scales round the central black spot, one observed having a central white spot on the upperside of the hindwings." Among the most beautiful of the blue ♀s are those belonging to the Central Asiatic races, described in detail (*postea*), and we have also noted (*suprà*) Oberthür's remarks as to the colour of the spring form in Algeria, fairly well supported by the specimens in the British Museum coll. Graves states that, whilst the ♀s of *P. icarus* captured in May, 1905, in Syria, were in many cases suffused with blue at the bases of the wings and with greyish-blue around the orange marginal spots of the hindwings, those taken in July, 1904, at Ain Zahalta, showed no blue scaling at all. Romanoff notes (*Mém.*, i., p. 52) that blue ♀s occur in Transcaucasia. Miss Fountaine notices (*Ent.*, xxxvii., p. 157) the occurrence of a beautiful ♀ form, shot with blue over almost the entire area of the wings, not uncommonly at Amasia and Tokat, whilst Staudinger (*Hor. Soc. Ent. Ross.*, xiv., p. 243) states that, on the Jenikeui plateau, in July, 1875, a small number of quite blue ♀s were found, which, at the same time, had fully retained their red marginal spots. The blue form of the ♀, he adds, also occurs in Germany, and more particularly in Lapland, but, in this case, the red marginal spots are wanting. Rowland-Brown notes (*Ent.*, xxxix., pp. 226, 246) the Swedish examples from Abisko and Alten as not differing from the ordinary British examples on the upper- or underside; but that the ♀s, besides those noted as *ab. caerulea*, are much suffused with blue at Abisko; at Alten this character is less pronounced, but one ♀ shows an almost black ground-colour, the blue shining lustrously over it, as in the ♀s of *Plebeius argyrognomon* var. *aegidion*. Federley notes (*in litt.*) that, in Finland, the *ab. caerulea* occurs quite commonly among the type. At Gibraltar, where the insect is on the wing from February to November, Walker states (*Trans. Ent. Soc. Lond.*, 1890, p. 373) that the ♀s are much more blue above even than English specimens, but in

the middle of summer they are very dark with little or no blue, a most unexpected statement considering how blue the British ♀s frequently are in both the early summer and autumn broods. Blachier states (*in litt.*) that many forms of the ♀ occur in the Geneva district, among which he notes—

- (1) Entirely brown, with or without red lunules.
- (2) Brown with base blue, with or without red lunules.
- (3) Almost entirely blue, usually with lunules, surmounted with black chevrons, the blue reaching to the lunules.
- (4) Almost entirely blue with black border to the forewings, which are without lunules; some red lunules resting on the black marginal spots and surmounted with chevrons on the hindwings.
- (5) Almost entirely blue, with large orange-red lunules on all four wings (Veyrier, 27. viii. '07; St. Cergues, 20. vii. '94).
- (6) Blue ♀, in which the black chevrons surmounting the red lunules on the hindwings, are lightened with white interiorly, the white usually affecting the form of the chevrons or triangles, especially in cells three and four (nr. Geneva, 29. v. '09, 9. vi. '09, 17. ix. '09).

Blachier adds that he has, in his collection, ♀s similar to these last, but of a more azure and clearer blue, and with more white, from Syria, where, however, this form of the ♀ appears to be rare, also 2 similar ♀s from Sussex in England. Reverdin gives (*in litt.*) some interesting notes on the blue-scaled specimens in his collection, remarking that (1) out of seven examples of *ab. icarinus* in his collection three are blue-scaled, of ten *ab. candiope (iphis)* six are blue-scaled, of nineteen normally spotted ♀s with two basal points three are blue-scaled. Separately from these he notes that, of twelve ♀s captured at Pardigon at the commencement of April, 1908, six are slightly powdered with blue. Blachier particularly notes (*in litt.*) a Sussex ♀, the base powdered with blue, in which the two apical lunules of the forewings above are not orange-red like the others, but white, whilst, in another ♀, the three apical lunules are of the same colour; he adds that he has never seen the form from elsewhere. Wheeler states that the ♀s of the summer brood in the Apennines (Assisi) are by no means large, and rarely have any touch of blue on the uppersides. In southern France and northern Italy comparatively few of the ♀s are scaled with blue in the summer (August) brood, *e.g.*, at Grésy-sur-Aix, Susa, etc., but one supposes the spring brood is less constant. The difference in size is also sometimes stated to be directly connected with the spring and summer broods, the latter often being said to be smaller, but this again is only very approximately true. There is certainly remarkable variation in the size of the species, several dwarf forms being named (see *postea*), of which two, at least, are assumed to be racial (*nana*, Grund, and *lucia*, Culot) and one seasonal (*parvula*, Kroul.), whilst Walker states (*Trans. Ent. Soc. Lond.*, 1890, p. 373) that, in the Gibraltar district, in the middle of summer, very small examples occur, some not exceeding 18mm. in expanse, thus suggesting again a seasonal cause for the development of the small forms. Staudinger says (*Hor. Soc. Ent. Ross.*, xiv., p. 242) that the Amasian specimens vary in size, from 20mm. to 32mm., without, however, any remark as to the difference not occurring in specimens of all the broods. The smallest examples of the species barely reach 16mm., whilst the largest are fully 38mm. (*ab. major*). It would appear that the species is usually largest in those areas, either at fairly high latitudes or altitudes, where the species is single-brooded, and smaller in the summer and autumn broods than in the spring,

although this is by no means always the case. Massey records (*Ent. Rec.*, xx., p. 144) on the larger size of the specimens of this species in the north of Britain than in the south, those from the Grange district of North Lancashire, Ireland, and West Scotland, being larger than those from the south of England, the Grange and Irish being in turn larger than the Scotch. We believe that the largest British examples that we have ever seen came from the Isle of Lewis, and have always supposed this larger size to be due to the longer feeding-period, the species in these districts being usually later in appearance than in the south, and, to a much less extent, partially double- or even triple-brooded, for it is generally the case, as noted above, in all the districts, at home and abroad in which we have collected that, in double-brooded areas the second brood is usually smaller than the first, and the examples of single-brooded areas at fair elevations larger than either. One of the finest races, for size, that we have captured, is that of Bourg St. Maurice, at the foot of the Little St. Bernard, where the species occurs abundantly in July and early August, of a size that is equal to the finest examples of var. *clara* of Ireland or Scotland, but the ♂s of a lovely lilac-blue, and not bright blue as in the latter. Blachier notes (*in litt.*) that, in the Geneva district, the species averages, ♂ 30mm., ♀ 29mm., whilst the largest examples he has measure, ♂ 34mm., ♀ 31mm., and the smallest, ♂ 21mm., ♀ 17.5mm., the last named of the *hyacinthus* form; altogether, Blachier says that his collection contains a series of twelve ♂s and ♀s less than 23mm. in expanse, the specimens coming from the Geneva district, the south of France, and the Italian Simplon. The largest ♂s and ♀s in the British Museum coll. reach 38mm., the smallest ♂ 22mm., and the smallest ♀ 20mm. The colour variation in the ♂s is very considerable, extending normally from a warm lilac-blue, through purple-blue to a bright *bellargus*- or *escheri*-like tint (= *clara*, Tutt), and occasionally to a brilliant glossy *hylas*-blue (*hylasoides*, n. ab.) a colour that becomes almost normal in the Central Asiatic races. Occasionally, a specimen of *eros* colour, or colour approaching *coridon* is recorded (ab. *eros*, Stphs.), and Barrett mentions one of dark iron-blue colour, somewhat like that of *Lycaena arion* (= ab. *arionoides*, n. ab.). Besides these, a pale form is developed, as a very rare aberration, with a slaty rather than a blue tint (= ab. *livida*, Gillm.). Blachier says that, in the Geneva district, the ♂s are normally more or less deep violet-blue (agreeing probably with our designation warm lilac-blue), very rarely quite blue, although occasionally of a brilliant azure-blue suggesting that of *Polyommatus escheri* (= ab. *clara*): Reverdin also notes the colour as being sometimes pure blue, but usually a little violaceous or mixed with red, specimens of both tints being found on the same day in the same place. The typical lilac-blue form very frequently weakens off in its scaling in the summer races to the ab. *pallida*, a very pale lilac form; another typically-coloured lilac form is plentifully supplied with long white silky hairs, the costa being markedly white (= *dorylas*, Germ.), whilst the blue form with little or no lilac or purple in its tint, and with well-developed long silky white hairs was named *candaon* by Bergsträsser. Jenner-Weir notes (*Ent.*, ix., p. 254) a ♂ of this species, in which one of the wings, compared with the other three, is of a distinctly more lilac-colour. The narrowness of the marginal border in the ♂s of this species is such, that any development beyond the normal is quickly noticeable, and

the wider-banded form has been already at least twice named, once by Bergsträsser as *candybus*, and more recently by Courvoisier as *latimargo*. The hindwings of the ♂ are occasionally marked with small interneural marginal black spots; this feature has become almost racial in the Mauretanian form, *celina*, Aust., and the latter name has been generally applied to such forms; but *celina* is a local race, named on general characters, the specimens not always possessing these spots, and characterised, in addition, by its wide outer marginal band; nothing can be more different than the large ♂s from Ireland, Scotland, or even Germany, in which these spots are present, and the smaller *celina* race in which they so frequently occur, and so we apply Cockerell's name *nigromaculata* to the normal specimens presenting this character. Blachier considers that the tendency to develop these spots is much more marked in the valleys south of the Alps than in those north; rarely more than traces occur, he says, in the better marked examples from the northern localities, but well-developed spots in the southern ones. Grund has named the small *minor* examples with these marginal spots *nana*. Occasionally, and only to a very slight extent, a ♂ of the *nigromaculata* form shows the slightest possible trace of reddish above the two marginal spots nearest the anal angle of the hindwings, thus forming a parallel variation to *Plebeius argus* ab. *bella*, etc.; this form has been named *rufopunctatus* by Neuburger. The variation in the ♀ is, however, much more extensive than in the ♂, and quite as wide a range occurs in this sex of the species as in that of *Agriades coridon* and *A. thetis*. The direction of variation is also parallel with that in these species in (1) intensity of ground colour, (2) number and intensity of submarginal orange lunules, (3) the tone and amount of the blue scaling, (4) the presence of white markings setting off the spotted areas. There is, in addition, a most marked character in the form of a wedge-shaped dash (*cuneata*) that is sometimes strongly developed in the discal area of the hindwings, and corresponding more or less with the white dash found in the same position on the underside of these wings, and often causing considerable modification in the character of the blue scaling; whilst the tendency to the outlining of the discoidals in both wings, either in white or pale blue, or even as wholly white or blue spots, is also noticeable, as is, further, the white or blue lunular edging to the orange lunules of all the wings. Von Rottemburg recognised much of the ♀ variation when he described the species (see *antea* p. 115), although Bergsträsser, Esper, and other authors failed badly with some of the common forms. There are three very distinct tints in the ground colour of the ♀ — (1) quite brown or fuscous (= type), (2) black-brown (sometimes almost leadenbrown) (= *atrescens*), whilst occasionally the ground colour is (3) paler than in the type and with a somewhat greyish tinge (*pallescens*). These are all similarly marked with (or without) fulvous submarginal lunules, and are similarly scaled with blue, so that any tabulation applicable to the brown or typical form is equally applicable to the others, and to which the names applied in the tabulation (see *infra*) should be applied in combination with *atrescens* or *pallescens* as the case may be. All the forms, too, are equally scaled with blue. The fulvous marginal lunules of the upperside are usually full-coloured, but sometimes they are quite pale yellow (*flavescens*), at others of a deep orange, approaching red (*aurantescens*), especially in some of the southern summer forms, in which also a tendency to an extension of the lunules towards the centre of the wings



is occasionally noticeable (*ab. rufina*, Obth.). The marginal black spots are sometimes edged externally with white (*albomarginata*) or blue (*caeruleomarginata*), whilst the discoidals, usually simply a dark lunule, are sometimes ringed with white on all the wings (*albocincta*), or with blue (*caeruleocincta*), or they may be replaced by white spots (*albopuncta*) or blue spots (*caeruleopuncta*); sometimes these characters occur on the hindwings only (*posticoalbocincta*, etc.), at others on the forewings only (*anticoalbocincta*, etc.). The marginal spots are frequently edged internally with white (*albolunulata*) or with blue (*caeruleolunulata*) lunules, whilst a large wedge-shaped streak, sometimes white (*albocuneata*) at other times blue (*caeruleocuneata*) stretches across the disc of the hindwing. Rarely, especially in the very blue forms, the costa is white = *albicosta*. In many examples the various markings are combined and the aberrations are very interesting. So complicated, however, are the combinations arising from the modification of the orange lunules, pale lunules, blue scaling, whitish shades, etc., that a tabulation of the various forms is most difficult. The following, however, is based on examples that are either in our possession or have come under our notice—

- 1.—Brown without any orange marginal lunules = *ab. fusca*, Gillm.
- 2.—Brown with orange marginal lunules on hindwings only = *ab. thersites*, Gerh.
- 3.—Brown with orange marginal lunules on all the wings = *icarus*, Rott.
- 4.—Like 3, but with pale interneural lunules towards apex of forewings = *ab. apicata*, n. ab.
- 1a.—Like 1, but with pale\* lunules internally edging the marginal area = *ab. fusca-albolunulata*, n. ab.
- 2a.—Like 2, but with pale lunules internally edging the marginal area = *ab. thersites-albolunulata*, n. ab.
- 3a.—Like 3, but with pale lunules internally edging the marginal area = *ab. albolunulata*, n. ab.
- 4a.—Like 4, but with pale lunules internally edging the marginal area = *ab. apicata-albolunulata*, n. ab.
- 1b.—Like 1, but with pale\* wedge-shaped mark on hindwings = *ab. fusca-cuneata*, n. ab.
- 2b.—Like 2, but with pale wedge-shaped mark on hindwings = *ab. thersites-cuneata*, n. ab.
- 3b.—Like 3, but with pale wedge-shaped mark on hindwings = *ab. iphis-cuneata*, Tutt.
- 4b.—Like 4, but with pale wedge-shaped mark on hindwings = *ab. apicata-cuneata*, n. ab.
- 1c.—Like 1 (1a or 1b)†, but with the basal area of wings scaled with lilac-blue = *ab. fusca-caerulescens*, n. ab.
- 2c.—Like 2 (2a or 2b), but with the basal area of wings scaled with lilac-blue = *ab. thersites-caerulescens*, n. ab.
- 3c.—Like 3 (3a or 3b), but with the basal area of wings scaled with lilac-blue = *caerulescens*, Wheeler.
- 4c.—Like 4 (4a or 4b), but with the basal area of wings scaled with lilac-blue = *apicata-caerulescens*, n. ab.
- 1d.—Like 1 (1a or 1b)‡, but with the wings scaled with lilac-blue to beyond the discoidal = *ab. fusca-thestylis*, n. ab.

\* "Pale" = white or blue, etc.; when "white" then *albolunulata*, *albocuneata*, when "blue" *caeruleolunulata*, *caeruleocuneata*, etc., these terminations being added to all the following forms.

† The same forms occur as (1) *fusca-caerulescens-albolunulata*, *thersites-caerulescens-albolunulata*, etc., etc., (2) *fusca-caerulescens-caeruleolunulata*, etc., etc., (3) *fusca-caerulescens-albocuneata*, *thersites-caerulescens-albocuneata*, etc., etc.

‡ The same forms occur as (1) *fusca-thestylis-albolunulata*, *thersites-thestylis-albolunulata*, etc., (2) *fusca-thestylis-caeruleolunulata*, etc., (3) *fusca-thestylis-albocuneata*, *thersites-thestylis-albocuneata*, etc., (4) *fusca-thestylis-caeruleocuneata*, etc.

- 2d.—Like 2 (2a or 2b), but with the wings scaled with lilac-blue to beyond the discoidal=ab. *thersites-thestylis*, n. ab.
- 3d.—Like 3 (3a or 3b), but with the wings scaled with lilac-blue to beyond the discoidal=ab. *thestylis*, Kirby.
- 4d.—Like 4 (4a or 4b), but with the wings scaled with lilac-blue to beyond the discoidal=ab. *apicata-thestylis*, n. ab.
- 1e.—Like 1 (1a or 1b)<sup>¶</sup>, but with all the wings scaled with lilac-blue, except the costa and outer margin=ab. *fusca-thetis*, n. ab.
- 2e.—Like 2 (2a or 2b), but with all the wings scaled with lilac-blue, except the costa and outer margin=ab. *thersites-thetis*, n. ab.
- 3e.—Like 3 (3a or 3b), but with all the wings scaled with lilac-blue, except the costa and outer margin=ab. *thetis*, Esp.
- 4e.—Like 4 (4a or 4b), but with all the wings scaled with lilac-blue, except the costa and outer margin=ab. *apicata-thetis*, n. ab.
- 1f.—Like 1 (1a or 1b)\*\*, but with the wings wholly scaled with lilac-blue=ab. *fusca-supracarulea*, n. ab.
- 2f.—Like 2 (2a or 2b), but with the wings wholly scaled with lilac-blue=ab. *thersites-supracarulea*, n. ab.
- 3f.—Like 3 (3a or 3b), but with the wings wholly scaled with lilac-blue=ab. *supracarulea*, Obth.
- 4f.—Like 4 (4a or 4b), but with the wings wholly scaled with lilac-blue=ab. *apicata-supracarulea*, n. ab.

The forms marked 1c-4c, 1d-4d, 1e-4e, 1f-4f also occur in the bright blue, as well as lilac-blue, form, and in the race described (*postea*) as var. *clara*, so that one gets a similar series of quite bright *escheri*-tinted, almost *bellargus*-tinted, blue forms. It is, however, quite impossible to deal with the multitudinous polymorphic conditions that prevail in the ♀s of this species, and we should prefer, unless any form has been separately named, to use these names for ♀s shaded with any tint of blue, so long as they were of the particular character indicated. The fringes of all the wings in both sexes are more or less distinctly divided into two zones, a dark inner area near the margin of the wing, and a paler outer one; the difference in tint being sometimes very slight and others very marked, but usually much more defined in the ♂ than in the ♀. Occasionally there is a tendency to the development of black dashes at the ends of the nervures, in the basal half of the fringes, the short bars rarely extending to the outer zone, and usually only in the hindwings (as is the case normally in *Polyommatus escheri*) (=ab. *lacon*, Kirby), and, when present on the upperside, generally very much less marked beneath. This feature has led to many wild statements by collectors who have suggested that examples marked thus might be hybrids between *Polyommatus icarus* and *Agriades thetis* (see *Proc. Ent. Soc. Lond.*, 1863, p. 177, and many others). Of such forms, South notes (*Proc. Sth. Lond. Ent. Soc.*, 1888-9, p. 64) a ♂ from Bishop Auckland with distinct patches of black in the fringes. Adkin also records (*Proc. Sth. Lond. Ent. Soc.*, 1890-1, p. 126), a ♂, taken at Snodland, Kent, in the spring of 1891, with the black lines extending into the fringes. Reverdin observes (*in litt.*) that, generally, the fringe of the ♂ is greyish in that part nearest the edge of the wing and white outside, but that sometimes, especially on the hindwings, a small dark triangle

¶ The same forms occur as (1) *fusca-thetis-albolunulata*, *thersites-thetis-albolunulata*, etc., (2) *fusca-thetis-caeruleolunulata*, *thersites-thetis-caeruleolunulata*, etc., (3) *fusca-thetis-albocuneata*, *thersites-thetis-albocuneata*, etc., (4) *fusca-thetis-caeruleocuneata*, etc.

\*\* The same forms occur as *fusca-supracarulea-albolunulata*, *thersites-supracarulea-albolunulata*, etc., (2) *fusca-supracarulea-caeruleolunulata*, *thersites-supracarulea-caeruleolunulata*, etc., (3) *fusca-supracarulea-albocuneata*, *thersites-supracarulea-albocuneata*, etc., (4) *fusca-supracarulea-caeruleocuneata*, etc.

occurs in the fringe at the tip of the nervures, which gives to the edge of the wing a festooned appearance reminding one of *Plebeius argyrognomon*, that he has eight examples thus marked in his collection, coming from Voiron (3), June 10th 1909, Bois des Frères, June 15th, 1909, Salins, July 4th, 1909, le Tour, July 22nd, 1908, Martigny (2), August 22nd, 1906. Sometimes, but very rarely, similar little black bars are found also at the end of the nervures of the forewings, *e.g.*, Grosvenor exhibited, at the meeting of the City of London Entomological Society, held October 2nd, 1906, a ♂, captured at Witherslack, with black dots in the fringes as in *Agriades thetis*. In the Pickett coll. are some exceedingly well-marked examples from Folkestone. Reverdin notes (*in litt.*) that, when the black tufts are also present at the tips of the nervures in the forewings as well as the hindwings, the butterfly suggests a faded *A. thetis*. This form with the black bars showing in the basal half of the fringes of both wings we call *fimbrinotata*, n. ab. Harrison records (*Ent. Rec.*, xviii., p. 247) a very peculiar division of the fringes that occurred on the underside of several ♀s captured at Birtley, stating that, on the upperside, the inner half of the fringes are grey, whilst, on the underside, a dark brown or almost black line runs parallel to the margin and bisects the fringes, but no ♂s with this character were observed. The underside variation is most interesting as to the difference in ground colour, as well as in the size, number, and modification of the spots. Sometimes the ground colour of the underside of all four wings is of the same shade, but, generally, that of the hindwings is rather darker than the forewings. Usually the underside of the ♂ is of a pale grey, sometimes inclining to whitish (*albescens*), at other times to bluish-grey (*clarescens*), dark grey (*griscens*), yet again to brownish-grey (*fuscens*), being then very like that of the usual tint of the ♀s. The underside of the ♀, though usually brownish, is sometimes grey-brown (*fuscens*), at other times yellow-brown (*cerrinescens*), or dark brown (*brunnescens*), whilst rarely it has almost a blackish tint (*obscurior*). The southern ♀s sometimes have the underside ground colour quite clear orange- or almost coffee-brown (*brunnescens*) and are really very characteristic, others again are of quite a fawn colour (*cerrinescens*) as also are some of the ♂s, when the sexes are quite inseparable by this means. As to the variation in colour of the underside, Hanbury notes that two ♂s taken at Kirkwall have the colour of the undersides quite brown, closely resembling that of an ordinary ♀; on the other hand, Prideaux notes a ♂ taken near Atherfield, Isle of Wight, in 1895, in which the usual fawn ground tint of the ♂s there is completely usurped by pure white, the fawn being restricted to a few slashes along the wing rays; Hanbury further observes that, near Lochinver, Sutherland, the specimens taken July 13th, 1894, had the ground colour of the undersides very pale. Staudinger remarks (*Stett. Ent. Ztg.*, xlii., p. 283) that Haberhauer sent from Ala Tau and Lepsa quite ordinary examples of *P. icarus*, but that, with these, was a smaller form, which, instead of being grey (♂) or brown-grey (♀) on the underside, is greyish-yellow in both sexes, quite different from all other *P. icarus* ever seen from the most diverse localities; he considered they might belong to a 2nd (or 3rd) brood taken near Lepsa, or be a special Steppe form. He further states (*Hor. Soc. Ent. Ross.*, xiv., p. 242) that the colouring of the underside varies greatly in the Amasian *P. icarus*, the examples of the 1st brood from ash-grey to grey-brown, those of the 2nd brood (and probably also the 3rd), being

light yellow-grey. Lang states (*Ent.*, xxxiii., p. 106) that the Corsican examples, taken in July, have a light underside and a very bright antemarginal orange band on the hindwings, whilst Wheeler notes (*Ent. Rec.*, xxi., p. 281) that, in the Apennines (at Assisi), the underside of the ♂s is sandy-brown in colour, the orange being particularly well-marked and forming a continuous band on the underside of both fore- and hindwings in the ♀s, the ground colour of which is a rich coffee-brown. Graves observes (*Ent. Rec.*, xviii., p. 150) that, in Syrian examples, the reddish band on the underside is always pronounced. This so-called reddish band consists of the coloured lunules surmounting the grey marginal lunules, which are, in their turn, again surmounted with pale grey or dark grey chevrons, the latter of various shapes, sometimes conical or pointed, at others arched or rounded. The usual fulvous lunules vary in tint, sometimes, in their richest forms, being bright vermilion in colour (ab. *rufescens*), orange-red (ab. *aurescens*), orange-yellow (ab. *lutescens*), pale yellow (ab. *flavescens*), or grey (*suffescens*), differing only, in intensity, from those of the upperside. The basal area of the underside of the wings in both sexes is often scaled with blue, sometimes the blue scaling extends to the discoidal area of the wing (= ab. *subcaerulea*), at others there is no blue at all (ab. *sinecaerulea*); the ♀s have much less blue scaling than the ♂s, and in the summer examples, particularly, there is frequently none at all. The variation in the size of the spots on the underside is sometimes very marked; those specimens that have the spots below the normal size but all present have been called *parvipuncta*, Courv., and those with them larger than usual *crassipuncta*, Courv. The position of the spots is also interesting; usually the submedian row of spots is well curved or angulated towards the costa and placed about midway between the discoidal and chevrons of the marginal series; occasionally the submedian spots are pushed back on all the wings until almost touching the chevrons (= ab. *discreta*) although their change in position may be restricted to the forewings (ab. *anticodiscreta*) or hindwings (= ab. *posticodiscreta*); at other times the spots of the submedian and basal series are brought up quite closely to the discoidal lunule (= ab. *glomerata*), although, again, the displacement may be restricted to the forewings (ab. *anticoglomerata*) or hindwings (ab. *posticoglomerata*). The variation in the number and arrangement of the spots on the underside is very great. On the forewings there are normally—two basal spots, the discoidal lunule, seven submedian spots, the two lowest ones in the same interneural space and usually united, whilst occasionally an 8th is present, on the costa, (= ab. *addenda*, n.ab.), sometimes this takes the form of a little streak, finally there is a series of marginal spots surmounted by orange or yellow lunules and these in turn by grey or blackish chevrons. The form with extra spots between the submedian series and discoidal lunules has been named *excessa* by Gillmer. On the hindwings there are four basal spots in an antero-posterior straight line, a median series consisting of eight spots of which the two lowest are united, whilst the series of marginal lunules is similar to that of the forewings but with the fulvous usually more strongly developed both in quantity and intensity. The modification of these spots has attracted a great deal of attention; the basal spots may vary from 0 to 5 or even more, the form with 0 being figured by Esper and named, 140 years ago, *icarinus* by Scharfenberg, that with one spot was figured and

named *candiope* by Bergsträsser, and later *iphis* by Meigen, whilst the specimens with 3 (*tripuncta*), 4 (*quadripuncta*), 5 (*quinquepuncta*) have been more recently specially designated by Courvoisier. It often happens that the numbers are not the same on the two wings. Of the submedian row, the most frequently absent of these spots appear to be 6 and 7, whilst, on the other hand, it sometimes happens that they are well-developed, the lower turned round outwardly to join with the chevron surmounting the lowest marginal lunule forming a distinct, (=ab. *virgularia*, n. ab.); this form is not uncommon, and Blachier notes examples from Veyrier, Gex, Thoiry, Russin, etc. Wheeler notes (*in litt.*) that this aberration appears in the British Museum coll. in two ♂s and several ♀s from the "Leech coll.," a ♀ from "St. Petersburg, July 10th, 1883," another from "Vernet," it also occurs in several south Italian and Corsican examples, and in several ♀s from Asia Minor and Greece. The aberration, he says, indeed, appears to be generally distributed and fairly common. Of the others the 3rd spot of the submedian series appears to have a greater tendency than the others to take on an oval, elongated or pyriform shape, although the whole series sometimes becomes modified in this direction. When this occurs in all the wings we get ab. *extensa*, when in the forewings only we get ab. *transiens*, Obth., when in the hindwings only ab. *postico-extensa*. The union of the submedian spots with the chevrons of the marginal lunules so as to form a series of black streaks on the forewings (=ab. *anticostrata*) or the hindwings (=ab. *posticostriata*) or both (=ab. *striata*), make striking aberrations, and partial union in other directions such as the extension of the submedian dots to touch the discoidal and the basal to join the discoidal (ab. *radiata*, n. ab.), the lower basal to join the lower submedian (*melanotoxa*, Mar.=*arcuata*, Weym., or *biarcuata* Tutt) are more or less frequent in the forewings; whilst, on the hindwings, the union of the upper basal and the 1st submedian (=ab. *costajuncta*, Tutt), the third basal and penultimate submedian (=ab. *basijuncta*), the 1st submedian and 1st marginal chevron (=ab. *apicojuncta*, n. ab.), is frequent, and so on. In the obsolete direction the hindwings seem to show much more frequently an absence of spots than the forewings [except in the case of 6 and 7, which is a form of obsolescence frequently associated with the *icarinus* or *candiope* (*iphis*) forms], and when the spots are largely absent in the submedian and basal series we get the form *semipersica*, Tutt, so named as being, in the obsolescent character of its spots, intermediate between the type and ab. *persica*, Bien.; described as having all the basal and submedian spots of both wings extinct; the form with them absolutely extinct only on the forewings is very rare (=ab. *antico-obsolata*), only on the hindwings (=ab. *postico-obsolata*). The form without orange lunules, as well as with the submedian and basal spots on all the wings absent, is *persica*, Bien.; it should not be isolated merely on account of its whiter ground colour, since the ♂s of *obsolata*, Clark (= *cacca*, Gillmer) are usually also quite pale or whitish-grey in their ground tint. Of the hypothetical *racua*, Gillm. (without spots or marginal lunules, or discoidals), we have, like Gillmer, never seen a specimen. Reverdin gives (*in litt.*) some details of the variation of the basal spots of the underside of the forewings in the specimens in his collection. He tabulates them, after separating those captured from Pardigon in dept. Var from those taken in other localities, as follows—

FOREWINGS.	OTHER LOCALITIES.		PARDIGON.	
	♂	♀	♂	♀
Two basal spots ( <i>type</i> ) ..	61	27	32	10
One basal spot ( <i>candiope</i> ) ..	5	1	4	0
No basal spot ( <i>icarinus</i> ) ..	17	15	0	1
Three basal spots ( <i>tripuncta</i> )	0	2	1	0

With regard to the variation on the underside spotting, Zeller notes (*Isis*, 1847, pp. 142-143) that aberrations, remarkable for the larger size of the spots, and for their union, especially that in which the lower basal spot is united in a bow to the lowest spot of the submedian row, are commoner in Southern Italy than in Central Europe. He specially mentions (*op. cit.*) a small ♂ (taken July 15th 1844) in which the four basal spots of the underside of the hindwings are enlarged and the 1st, 3rd and 4th are joined with the corresponding spots of the submedian row, which are also enlarged, *i.e.*, the specimen is a combination of *costajuncta* and *bi-basijuncta*. Federley notes (*in litt.*) that the ab. *icarinus* is very rare in Finland and that a specimen with obliterated markings on the hindwings is in the collection of the Helsingfors University (=ab. *posticoobsoleta*). Bird notes (*Ent. Rec.*, xviii., p. 280), the capture of a ♀ at Tintern, August 11th, 1906, with an extra upper spot in the submedian series of the forewing (*addenda*) and the spots between nervures 1a and 1b of hindwings elongated into the shape of a comma (,) (= *posticovirgularia*), another ♀ with the extra upper spot in submedian series of forewings, taken August 18th, 1906, at Tintern, and another ♀ taken August 22nd, 1906, with the same extra spot, and, in addition, the basal spots of the forewings asymmetrically united into a conglomeration of spots and streaks. Blachier notes (*in litt.*) a ♂ captured at Bergue, near Geneva, June 10th, 1909, with the *arcuata* or *melanotora* character of the forewing supplemented by the *basijuncta* form on the hindwing (really homologous markings in the two wings); in another ♂ from the Bois des Frères, the *arcuata*-mark of the forewing and the *costajuncta* mark of the hindwing are present; in another ♂, taken at Myes, near Geneva, June 6th, 1909, the 1st submedian and 1st chevron of the hindwing are united = ab. *posticoapicalis*, whilst, in another ♂, taken at Thoiry, August, the same mark on the hindwing appears, supplemented with an exactly homologous one at the apex of the forewing (=ab. *anticoapicalis*). Of the underside variation, Oberthür observes (*Etudes*, xx., p. 23) that the species sometimes entirely lacks the black spots on the underside and that he has a ♂ from Besançon, analogous with Hübner's *cinnus* (*op. cit.*, fig. 30), that a ♀ from Cancale (fig. 41) is much less spotted with black on the hindwings than usual, and that what spotting remains is not quite symmetrical; on the other hand, he adds, the species often shows considerable development of the black spots, especially in the forewings, *e.g.*, fig. 42, taken at Cancale, which may be looked upon in this respect as a transition to fig. 43, taken at Besançon and fig. 44 from Chartres . . . Sometimes certain spots are united. Others again, he adds, have no ocellated spots at the base of the forewings, as figured by Herrich-Schäffer (fig. 246), a form that Bellier notes as being not rare at Châteaudun. Warburg states (*Ent. Rec.*, i., p. 239) that asymmetrically spotted examples are often

captured on the French Riviera. Further particulars on the underside aberrations must be sought in our account of the various forms (*postea*). The described forms which we have discovered in our search through the literature relating to the species, are now given in fuller detail.

#### MALE ABERRATIONS.

*α. ab. albina*, [Verity, MS. ?]; Rebel, "Berge's Schmett.," 9th ed., p. 70 (1909). *Icarus* ab., Verity, "Flor. Riv. dell'Inst. Dom.-Rossi," i., p. 10 (reprint) (1903).—*♂*. Upperside whitish.

We cannot find that Verity has named the aberration noted as *albina* by Rebel. He describes (*Flor. Riv. dell'Inst. Dom.-Rossi*, i., p. 10) a specimen, captured by Tolomei on Monte Matanna that bears the same relation to typical *P. icarus* as do the vars. *nivescens* and *albicans* to *P. hylas* and *A. coridon* respectively, which is possibly the insect to which Rebel refers. He notes it as being of a pale lilac colour instead of the usual bright blue, whilst a pale reddish-chestnut replaces the black marginal border, the spots and margin of the underside also being of this colour, whilst the base is tinged with reddish. One wonders from this whether it differs from our *ab. pallida* (*infra*).

*β. ab. livida*, Gillm., "Int. Ent. Zeits. Gub.," iii., p. 64 (1909); "Ent. Rec.," xxi., p. 260 (1909). *Icarus* ab., Meyer-Dür, "Schmett. Schw.," p. 80 (1852); Adkin, "Proc. Sth. Lond. Ent. Soc.," 1888-9, p. 165, pl. i., fig. 2 (1890).—*♂*. The beautiful light blue of the *♂* is, in this form, replaced by a lead-coloured grey-blue. Found in August, 1907, by Herr J. Griebel, of Neustadt, in a meadow near Speyer. Types in Herr Griebel's and my collection. Analogous to *L. bellargus* ab. *suffusa*, Tutt (Gillmer).

This form was first noticed by Meyer-Dür who notes (*Schmett. Schw.*, i., p. 80) that he found, in Meissner's coll., a *♂* of ash-grey colour, like that of *Latorina orbitulus*, which, however, when he wrote, had long since come to grief. Adkin, then exhibited a *♂* of a pale bluish-lavender colour, at the meeting of the South London Entomological Society, held November 14th, 1889, the specimen having been captured by Austen at Folkestone. In the British Museum coll. are four *♂*s of pale bluish-grey colour—(1) of large size, labelled "Carrick Hill, Roscrea, Ireland, 20. vi. '95, C. J. Gahan." (2) Another *♂*, labelled "Corville, Roscrea, Ireland, 21. vi. '95, C. J. Gahan." (3) "Crete, near Canea. D. M. A. Bate, 1904." (4) A small *♂* from "Granada (23. iv. 1901, Yerbury)," worn, and looking as if damped: one is inclined to wonder whether all these specimens have not been naturally or artificially affected by damp (or the condition of the collecting-box) after emergence. At the meeting of the Entomological Society of London, held October 3rd, 1906, another example, described as a slate-coloured aberration of the *♂*, taken near Chatham on August 24th, 1906, was exhibited by A. H. Hamm. We have not, of course, seen Gillmer's type, but doubt whether this aberration is analogous with our *Agriades thetis* ab. *suffusa*; it appears rather to be analogous with *A. thetis* ab. *czekeli*, Aign.-Abafi.

*γ. ab. pallida*, Tutt, "Brit. Butts.," p. 175 (1896); Lamb., "Pap. Belg.," p. 232 (1902); Gillm., "Int. Ent. Zeits. Gub.," ii., p. 11 (1908); Rebel, "Berge's Schmett.," 9th ed., p. 70 (1909). *Icarus* ab., Barr., "Brit. Lep.," i., p. 78 (1892).—*♂*. Pale lilac blue in tint (Tutt).

This is, in some respects, the palest of the tints through which the blue colour of the *♂*s of this species usually ranges, without becoming grey. It has a very distinct reddish tinge in the blue, and appears



to be wanting, in a great measure, the long silky-white hairs so characteristic of the brighter blue forms. Barrett says that the very pale forms in England, seem to be found mainly on the south coast, and their deficiency in colour arises in some cases from absence of the brilliant delicate hair-scales with which the upperside is usually furnished, in others from actual poverty of ordinary scales; it seems probable that these deficiencies arise from insufficient or too dry food—burnt up by the hot sun; strangely, the same cause seems at times to produce very small specimens.

δ. ab. *dorylas*, Jermyn, "Butt. Collector's Vade Mecum," 2nd ed., p. 144 (1827); 3rd ed., pp. 50, 115 (1836). *Icarus* ab., Esp., "Schmett. Eur.," pt. 1, pl. xxxii. (supp. viii.), fig. 4 (1777).—♂, above of a bright lilac-blue, or, as it were, silky, with the posterior margin black, anterior margin and fringe white. [♀, wings above brown, with the disc more or less blue, also sometimes entirely brown; with a band at the posterior margin of orange subocellated spots common to both wings; underneath, the wings are of a deep ash-colour or drab; fringe barred with brown. Underneath, in both sexes, nearly the same as in the two preceding species (*P. corydon* and *P. adonis*), but the central white spot in the disc of the secondary wings has an indistinct pupil.] [Is this *P. alexis* of Stephens' list?] (Jermyn).

This is a rather common form of the ♂, possibly the same as von Rottemburg's type, a bright lilac-blue with a distinct tinge of red in the colour, with, in addition, long silky-white hairs, and markedly white costa. We look upon this as the more especially characteristic *P. icarus* colour, and the major part of our specimens from most localities are of this hue; the lilac tint, especially of the disc, shading off into the more violet colour of the surrounding areas of the wings. Possibly *dorylas*, Jerm., should be considered synonymous with the type. The ♀, as here described, is possibly referable to *Agriades thetis*.

ε. ab. *candaon*, Bergsträsser, "Icon.," dec. i., pl. vi., figs. 3-4 (1779); "Nom.," iii., p. 3, pl. xlix., figs. 3-4 (1779); Göze, "Ent. Beit.," iii., pt. 2, p. 82 (1780). *Icarus* ab., South, "Ent.," xx., pl. ii., fig. 1 (1887).—*P.P.R.* alis rotundatis integerrimis cœruleis immaculatis, fimbria alba, subtus maculis conicis in posticis fasciolaque mediis in marginalibus anticarum ocellis fulva. Wings rounded, entire, blue, quite unspotted, with white fringes, beneath with orange wedge-shaped spots on the hindwings; a similarly coloured, but narrower, band on the forewings. In general appearance on the upperside near *candybus*, but very different on the underside. Is it a distinct species or only an aberration of the latter? (Bergsträsser).

Borkhausen, in 1788, recognised (*Sys. Besch.*, i., p. 161) this as a form of *P. icarus*. It is the common bright blue form of *P. icarus* without red on the one hand or purple on the other in its composition. It is usually well provided with long silky white hairs, especially at the base and along the costa.

ζ.—ab. *hylasoides*, n. ab.—♂. The colour of the bright shiny glossy tint of blue, characteristic of *Polyommatus hylas*.

This form occurs as an occasional aberration in Britain, as well as on the Continent. In the eastern part of its range it is almost racial (see our notes on the Central Asiatic races). Barrett refers (*Brit. Lep.*, i., p. 77) to one in Adkin's collection; we recently saw three there (1) from Muchalls, Kincardine, (2) Eastbourne, Sussex, right on coast, September 17th, 1906, (3) Boxhill, Surrey, June 19th, 1909, and there are several others in different British collections. Stefanelli says (*Bull. Ent. Soc. Ital.*, xxxii., p. 336) that examples of a vivid blue colour are taken near Florence.

η. ab. *eros*, Stphs., "Illus. Haust.," i., p. 93 (1828); Dale, "Hist. Brit. Butts.," p. 71 (1890). *Icarus* ab., Joy, "Proc. Sth. Lond. Ent. Soc.," 1886,



p. 29 (1886); Barr., "Brit. Lep.," i., p. 9 (1892).— $\sigma$ . *Alis pallidè cyaneis immaculatis, aut fuscis, subtus cinereis, punctis numerosis ocellaribus, posticis fasciâ marginali flavâ oblitteratâ.* This is probably a distinct species, and may be known by the peculiarly pale silvery- or greenish-blue colour of its upper surface. . . . Mr. Haworth's specimen was found, I believe, in Kent; and mine, characterised as var.  $\beta$ , I took in July, 1826, in a grassy lane near Ripley, Surrey (Stephens).

Of the colour of *eros*, or approaching that of *coridon*, on the upper-side. This is the *erosoides* form of *P. icarus*, for which, if it be accepted that the specific name of an insect cannot be used even for an aberration of another species in the same genus; *eros*, Stephens, cannot stand, and *erosoides* would have to be substituted, as, according to our views, *icarus* and *eros* are both in the genus *Polyommatus*. To ourselves, *Polyommatus icarus* ab. *eros*, Stphs., and *Polyommatus eros*, Ochs., are such different insects, that no chance of mistake could occur with experts, and it is only for these one writes. Barrett notes a  $\sigma$  in the Webb coll. taken at Dover of precisely the pale silvery-blue of *Polyommatus eros*, whilst Joy exhibited, at the meeting of the Sth. London Ent. Soc., February 4th, 1886, a dwarf example somewhat similar in colour to that of *Agriades coridon*.

$\theta$ . ab. *candybus*, Bergs., "Nom.," ii., p. 78, pl. xlviii., figs. 1-2 (1779); Göze, "Ent. Beit.," iii., pt. 2, p. 80 (1780). *Latimargo*, Courv., "Mitt. Schw. Ent. Gesell.," xi., p. 23 (1903); Gillm., "Int. Ent. Zeits. Gub.," xviii., p. 2 (1904); Rebel, "Berge's Schmett.," 9th ed., p. 70 (1909).—*P.P.R.* *alis rotundatis integerrimis cæruleis immaculatis fimbria alba; subtus in utrisque fulvis maculis, ocellisque plurimis.* With rounded blue unspotted wings and white fringes; beneath, on both wings, orange lunules and many ocellated spots; certainly no aberration of *argus*, although perhaps the *agestis* of the Vienna entomologists, if the marginal spots also occur in the latter species on the hindwings. The transverse orange band is not continuous but interrupted, in narrow spots, the hindmost of which are longer and broader, the foremost shorter and narrower. Whether it is sexually related to the following (*candiope*) I cannot assert (Bergsträsser).

Borkhausen recognised (*Sys. Besch.*, i., p. 161) this as a form of *P. icarus*. Bergsträsser's figures show it to be a  $\sigma$  of the latter species, although the upperside is exceptional in having a wide margin to all four wings; the fringes are white; the underside is inclined to the form with an increased number of spots, there being an extra spot between the submedian row and the discoidal spot of the forewing. It is, therefore, also the oldest name for ab. *excessa*, Gillm., but we retain the name for the wide-margined form, as it shows this character more markedly; it will, therefore, replace the more recently-named *latimargo*, Courv.

$\iota$ . ab. *nigromaculata*, Ckll., "Ent.," xxii., p. 99 (1889); "Ent. Rec.," i., p. 306 (1891). *Icarus* ab., Staud., "Hor. Soc. Ent. Ross.," xiv., p. 242 (1879); South, "Ent.," xx., pp. 74, 216 pl. ii., fig. 3 (1887); Weir, "Ent.," xxi., p. 216 (1888); South, "Proc. Sth. Lond. Ent. Soc.," 1887, p. 62 (1888); *op. cit.*, p. 65 (1889); Weir, *op. cit.*, p. 54 (1889); Tutt, *op. cit.*, p. 54 (1889); Walker, "Trans. Ent. Soc. Lond.," p. 373 (1890); Barr., "Proc. Sth. Lond. Ent. Soc.," 1890-1, p. 146 (1891); Sheldon, "Ent. Rec.," v., p. 17 (1894); Steff., "Bull. Soc. Ent. Ital.," xxxii., p. 336 (1900); McArth., "Ent.," xxxiv., p. 305 (1901); Reuss, "Ent. Rec.," xxi., pp. 211, 236 (1909). *Alexis* ab., Russ., "Ent. Rec.," i., p. 282 (1891); Reid, *op. cit.*, p. 282 (1891); Webb, *op. cit.*, p. 282 (1891); Barr., *op. cit.*, ii., p. 299 (1891); Tutt, *op. cit.*, iii., p. 270 (1892). *Celina*, Tutt, "Brit. Butts.," p. 175 (1896); Grover, "Ent. Rec.," ix., p. 312 (1897); Fleck, "Macr.-Lep. Rumän.," p. 21 (1901); Wheeler, "Butts. Switz.," p. 36 (1903); Verity, "Bull. Ent. Soc. Ital.," xxxvi., p. 138 (pubd. 1905); Smallm., "Ent. Rec.," xix., p. 41 (1907); Lamb., "Cat. Léop. Belg.," p. 425 (1907); Gillm., "Int. Ent. Zeits. Gub.," ii., p. 11 (1908); Grund, *op. cit.*, p. 79 (1908); Wheeler, "Ent. Rec.," xxi., p. 281 (1909); Seitz, "Gross-Schmett.," i., p. 312, pl. 80g (1909); Rebel,

"Berge's Schmett.," 9th ed., p. 70 (1909). *Punctigera*, Aigner-Abafi, "Ann. Mus. Nat. Hung.," iv., p. 516 (1896). *Punctifera*, Courv., "Mitt. Schw. Ent. Gesell.," xi., p. 23 (1903); Gillm., "Int. Ent. Zeits. Gub.," xviii., p. 2 (1904); Rebel, "Berge's Schmett.," p. 70 (1909).—♂. With a marginal series of interneural black spots on the upperside of the hindwings.

The character by which this aberration is distinguished was first noted by Austaut, in 1879, in his description of the Mauretanian race, *celina*, but the latter is so specialised in other directions that we prefer to retain the name *celina* for the Mauretanian race, and apply Cockerell's name to the aberrations that merely present this character in otherwise typical specimens occurring in various parts of the range of this species. The form is pretty generally distributed as a more or less local aberration in the British Isles, much more abundantly, however, in the most western localities in Ireland and Scotland than in England. Weir strangely supposed (*Ent.*, xxi., p. 216) the development of the spots to represent some slight gynandromorphic tendency. South records the capture of a ♂ of this form in June, 1887, at Ventnor; Grover, on June 17th, 1897, at Guildford; Sheldon took it between June 24th and July 10th, 1893, at Morteheo, and Smallman on August 5th, 1906, at Wimbledon, whilst others are recorded from Lewes (Weir), Deal (Tutt), Sligo (Russ), Pitcaple (Reid), Munden (Reuss), Portlaw (Raynor), etc. South notes (*Proc. Sth. Lond. Ent. Soc.*, 1888-9, p. 65) that, of 70 examples received from Perth, fourteen exhibited black dots on the hind-margin of the upperside of the hindwings; McArthur records (*Ent.*, xxxiv., p. 305) that a greater proportion of the ♂s captured in the Isle of Lewis, in 1901, had black dots than was the case in 1887, whilst Rose states that the ♂s from Rannoch are large and bright, some with black dots just within the margin of the hindwings on the upperside. Reuss records (*Ent. Rec.*, xxi., p. 211) a very bright ♂, almost of *A. thetis* tint, with a well-developed row of jet black marginal spots on the hindwings as in *A. thetis* ab. *puncta*, taken at Munden, Herts., June 13th, 1909. On the continent it appears to be more frequent in the south than elsewhere. Blachier notes (*in litt.*) that, in the Geneva district, examples of this form are rare, and that, when the spots are present, they are rarely more than traces, but, in the valleys of the southern Alps, the aberration appears to be more frequent, and that, in two specimens from the Val Antigorio, taken respectively on July 12th and August 10th, 1905, six large well-developed spots are present; Reverdin adds that he has an exceptionally well marked example taken at Pardigon, April 11th, 1908, and others less strongly marked from the same locality (April 15th, 1908), St. Nicolas (August, 1896), Arolla (July 30th, 1906), and Salins (July 25th, 1905). Verity observes (*Bull. Ent. Soc. Ital.*, xxxvi., p. 138) that, on the Lucca coast, ♂s with this series of black dots are rather frequent, the intermediate form with smaller spots, more so. Wheeler states (*Ent. Rec.*, xxi., p. 281) that the late summer brood at Assisi and Siena are of a deep, royal blue, some specimens having a row of black spots round the hindwing. Lowe notes that only about half-a-dozen ♂s of *P. icarus* were seen at La Granja from mid-June to mid-July, 1908, but these were all of this form; Lang observes (*Ent.*, xvi., p. 280) that, at Gibraltar, the ♂s have, very frequently, a marginal row of small black dots on the hindwings, and Walker adds (*Trans. Ent. Soc. Lond.*, 1890, p. 373) that some of the ♂s in the Gibraltar district are very bright and have a submarginal row of small black dots on the upperside of the secondaries, whilst, in the middle of summer, very small examples

occur, not exceeding 18mm. in expanse, the ♂s having the series of submarginal spots faintly indicated (=ab. *nana*, Grund). Kruger says that at Algeçiras the ♂s are of a very much lighter, and more brilliant, blue than in typical specimens from Germany, and with black spots along the fairly broad border on the upperside of the hindwings. Aigner-Abafi renamed (*Ann. Mus. Nat. Hung.*, iv., p. 516) this form *punctigera*, on the strength of an example taken July 31st, 1895, at Eperjes by Dahlström. [His published note, says a ♀, but a letter from Aigner now in our hands, referring to this aberration, shows that this is a *laps. cal.* for ♂.] Staudinger notes (*Hor. Soc. Ent. Ross.*, xiv., p. 243) that, one ♂, captured at Amasia in 1875, had black marginal spots before the border of the hindwing, whilst, in another ♂ from Syria, the spots are more fully developed.

κ. ab. *rufopunctatus*, Neub., "Soc. Ent.," xxi., p. 180 (1907); Rev., "Bull. Soc. Léop. Genève," i., p. 375 (1909). *Icarus* var. 2, Zeller, "Isis," p. 154 (1847). *Rufopunctata*, Rebel, "Berge's Schmett.," 9th ed., p. 70 (1909).—A striking aberration which bears, on the upperside of the hindwing, on the inner margin at the point where it meets the outer margin, two clearly discernible red or orange-red spots, which stand out very beautifully from the blue ground colour so as to give a constant distinction. I name this form *icarus* ab. *rufopunctatus* (Neuburger).

Reverdin states (*Bull. Soc. Léop. Gen.*, i., p. 375) that Neuburger of Berlin has recently named an *icarus* ♂, from Beyrout, *rufopunctatus*, which shows on the hindwings near the anal angle two very distinct orange-red points, and that he further noted that he had received the same aberration from other localities, e.g., Sassari in Sardinia, and from Askabad. It is clear that this must always be a rare form in this species, as the marginal spots are rarely developed, except very locally. The best example that has come under our notice is one from Sicily labelled by Zeller, "Catania, 27. vi. '44," but it is not at all strongly marked, another "Syracuse, June 3rd," is very faintly marked, and these are the only specimens the British Museum coll. seems to possess. [The beautiful Syrian specimens referred to by Graves (*Ent. Rec.*, xviii., p. 150) as having the reddish-orange markings beautifully shown, as in *Cyaniris semiargus* var. *antiochena*, are, so far as a lovely ♂ in our possession is concerned, to be considered *Plebeius drusus* var. *pulchra*, n. var. Until the genitalia were examined by Chapman, and its specific value determined, we ourselves supposed the insect to be a form of *P. icarus*.]

#### FEMALE ABERRATIONS.

α. ab. *fusca*, Gillm., "Int. Ent. Zeits.," ii., p. 11 (1908); Seitz, "Gross-Schmett.," p. 312 (1909); Rebel, "Berge's Schmett.," 9th ed., p. 70 (1909). *Alexis*, Wood, "Ind. Ent.," p. 8, pl. iii., fig. 69 (1839). *Icarus* ab., Lovell-Keays, "Ent. Rec.," v., p. 184 (1894).—♀. Entirely brown or blackish-brown, without red marginal spots. Occurs in both broods (Gillmer).

This form is not common in England. Lovell-Keays records it from Caterham, May 22nd, 1894, etc.

β. ab. *thersites*, Gerh., "Mon.," p. 15, pl. xxviii., fig. 2c, ♀ (1853); Dale, "Hist. Brit. Butts.," p. 71 (1890).—♀. Brown, no submarginal orange lunules on forewings, but a series of small ones on hindwings.

γ. ab. *fuscioles*, Geoff., "Fourc. Ent. Paris.," p. 245 (1785).—L'Argus brun. Long. 6 lig. Larg. 13 lig. *Papilio* alis rotundatis integerrimis, nigro fuscis, fulvo-maculatis, subtus ocellis numerosis. Loc. prata; rarior (Geoffroy).

The normal-sized, dark, black-brown form of the ♀ with orange submarginal spots on both forewings. Similar, except for its dark colour, to the type.

δ. *ab. rufina*, Obth., "Etudes," xix., p. 14, pl. vi., fig. 52 (1894); xx., p. 23 (1896); Grund, "Int. Ent. Zeits. Gub.," ii., p. 79 (1908); [? Fletch., "Ent.," xxxvii., p. 317 (1904).] *Amoena*, Schultz, "Ent. Zeits. Guben," xviii., p. 93 (1904); Seitz, "Gross.-Schmett.," p. 312 (1909); Rebel, "Berge's Schmett.," 9th ed., p. 70 (1909).—♀. The upperside of the wings pale brown with reddish rays, as if the orange marginal lunules had spread to the middle of the wings. Oberthür coll. Captured by Vallantin at Bona, Algeria, 1890 (Oberthür).

There are two very fine examples of this form in the British Museum coll. marked "Mutzell coll.," but unfortunately without indication of locality. It is no doubt the same form that Schultz described (*Ent. Zeits. Guben*, xviii., p. 93) as "maculis fulvis supra radiatis." "The reddish-yellow marginal spots on the upperside of the forewings are in a striking way more or less drawn out into rays, sometimes coming out in a wedge-shape as far as the middle of the wing. In one example of this aberration the hindwings on the upperside are strongly dusted with blue, the forewings noticeably less so. Pilz coll., taken at Heinrichau, 1903; Claasen coll." Gillmer states (*in litt.*) that he also has a ♀, in which the elongation of one of the reddish-yellow marginal spots of the upperside of the forewing reaches to the discoidal spot. There is also a Surrey example of this form in Hodgson's collection.

ε. *ab. medon*, Esp., "Schmett. Eur.," i., p. 330, pl. xxxii. (supp. viii.), fig. 1 (1777).—*Alis supra fusco-nigricantibus, fasciis utrinque macularibus fulvis ad marginem, subtus ocellis numerosis.* Von Rottemburg has, under the name *alexis*, described a butterfly which, according to all the characters noted, is the one under consideration.\* This name, however, is already given to a very different butterfly, which we describe later (pl. xlv., figs. 1-2)†. We must, therefore, of necessity, choose another appellation, and it appears to me to be best to retain the name *medon* which Hufnagel has already applied to this or at least to one resembling it; it corresponds with von Rottemburg's *P. medon*, Anmerk. ebend., p. 10, no. 41‡. This species is only found very rarely with us, but must be much commoner in other localities, e.g., Frankfurt-on-Main. The illustration shows the ♀. I am unaware whether its consort has the blue of the *Argus*-species on the upperside of the wings as a sexual distinction; this, further observation must decide. The upperside of this species is of a quite peculiar shade, changing from brown-black to bluish-green, but yet only a single colour. The underside of all the wings is a brownish red-grey (Esper).

Esper's figure shows blue nervures, and this character, coupled with its large size, leads us to conclude that it is a large well-marked aberration of this species, with strikingly well-developed orange spots on all the wings, the underside of the form *icarinus*, which gives it a still more *astrarche*-like appearance. We have several examples of this description, which we can hardly distinguish on the upperside from *Aricia astrarche*, but our specimens of this *astrarchoides* form have no trace of the blue nervures exhibited in Esper's figure, nor does Esper's description notice them, but, on the contrary, he says it is "of a single colour."

ζ. *ab. pampholyge*, Bergstr., "Nom.," ii., p. 77, pl. xlvii., figs. 1-2 (1779); Göze, "Ent. Beit.," iii., pt. 2, p. 80 (1780).—*P.P.R. alis angulatis fuscis, lunulis anticarum ad marginem quinque, annulis posticarum senis fulvis; subtus cinerascens, fascia fulva.* The upperside of the wings brown, with five reddish-yellow lunules on the margin of the forewings, and six similarly-coloured lunules on the hindwings. The underside ash-coloured, with a reddish-yellow submarginal transverse band. Perhaps the ♀ of our *oceanus*, therefore only an aberration of *salacia* (pl. i., figs. 1-2) (Bergsträsser).

\* Von Rottemburg's description is given in a footnote.

† This is *Erebia ligea*.

‡ Here follows von Rottemburg's description of *medon*.

Borkhausen, in 1788 (*Sys. Besch.*, i., p. 161), recognised this as a form of *P. icarus*. It is the ♀ form in which all the wings are of an uniform fuscous colour, the outer margin of all the wings with orange lunules, those of the hindwings blue-edged outwardly (no other blue markings on the wings). It is, therefore, a form of *postico-caeruleo-marginata*, with orange lunules on all four wings. The underside is normal, with two basal spots to the forewings. [The anal angle of the hindwings is overdrawn, hence the "angulatis" of Bergsträsser's description (*suprà*).] Bergsträsser himself suspected this (*pampholyge*) as well as *salacia* (= *Agriades thetis* ♀) to be ♀ forms of his *oceanus* (= *P. icarus* ♀), hence his statement that *pampholyge* and *salacia* were possibly aberrations of the same species. As illustrating Bergsträsser's want of clear knowledge of the ♀s of this species and *A. thetis*, we may note that he figures (*Nom.*, iii., pl. lv., figs. 5-6) von Rottemburg's typical form of *P. icarus* (brown in tint with orange marginal lunules on the borders of all the wings), as an aberration of his *salacia* (pl. l., figs. 1-2) which is really *A. thetis* (see our preceding vol., p. 344).

η. ab. *polyphemus*, Esp., "Schmett. Eur.," i., p. 387, pl. 1. (supp. xxvi.), fig. 2 (1779).—*Alis ecaudatis fuscis, omnibus utrinque fascia marginali fulva, subtus fusco cinereis, punctis ocellaribus numerosis.* Among the *Argus* species, aberrations are no longer rare, and we are already acquainted with many, but one is often uncertain as to their subspecific, varietal or aberrational value, and, in this direction, the present insect offers some difficulty. It seems, however, that it wants a separate name, and the arbitrary one of *polyphemus* is chosen; it resembles *argus* and *medon* very much and the differences must be described carefully. The upperside is of the same brown as ♀ *P. argus*, the bright reddish-yellow bands, however, quite different, being formed of roundish, contiguous spots, whilst, in *P. argus*, they are more separated, and, in the forewings, much less often present, whilst they are always developed in *polyphemus*. This insect, moreover, never has the metallic spots on the outer margin of the underside of the hindwings, an essential character of *P. argus*, whilst, instead of the whitish band between the two outer rows of spots on the underside of the same wings, there is, in *polyphemus*, only a single elongated whitish spot in the middle of the wing. From *P. medon*, *polyphemus* is at once to be distinguished by its size, still more by its ground-colour which is greyish-black instead of a genuine glossy brown. The fulvous spots, which, in *polyphemus*, occur along the margin of all the wings are, in *medon*, larger and redder, but in *polyphemus* strongly tinged with yellow. The underside, also, has many more ocellated spots, which can readily be seen in comparing the figures. Common in September with *phlaeas* and *icarus* in wooded places. It is sometimes a line larger, often about half a line smaller, of the size of *P. tiresias*. The upperside is sometimes tinged with bluish-grey . . . on the margin of the upperside of the hindwing the spots are sometimes half-filled up with bluish, making as it were eyes without pupils. By the side of *polyphemus* is figured an aberration which may be the other sex. On the underside of the hindwing towards the body is a longish white spot resembling a stigma, usually there is here only one round spot; whilst the ocellated spots are somewhat differently placed; the white band on the border of the upperside of the hindwing instead of blue is also aberrant (Esper).

Esper's *polyphemus* is a rather small ♀ form of *P. icarus* with orange lunules on all the wings; the upperside tinged at the base and margin of the hindwings (outside the orange lunules) with blue, the underside of the *melanotoxa* (*arcuata*) type as recently noticed by Leonhardt, Rebel, etc., but, as Esper, in his description, particularly distinguished it by the upperside, and does not characterise it by the *arcuata* mark, although he says that it has "more ocellated spots on the underside," it is well to retain the name, as Esper evidently intended, for the upperside form, and not further complicate the synonymy really referring to the underside peculiarity. Borkhausen, in 1788, rightly recognised (*Sys. Besch.*, i., p. 161) this as an aberration of *P. icarus*.

θ. ab. *iphis-cuneata*, Tutt, "Brit. Butts.," p. 175 (1896). *Icarus-cuneata*, Gillm., "Int. Ent. Zeits. Gub.," ii., p. 11 (1908).—♀. Brown, with orange marginal spots and pale bluish or whitish wedge-shaped mark on hindwings (Tutt).

Not only does von Rottemburg mention the brown form with orange lunules on all the wings as one of the forms known to him, but the same form had already been described in 1763 by Scopoli (*Ent. Carn.*, p. 179) as *alexis* var. 2, and was later known to Gerhard as *iphis* (*Mon.*, pl. xxviii., figs. 1a-c), except that the latter is of a paler ground colour. We selected, in 1896, the latter name in combination with *cuneata* to represent this form, which has, in addition to the typical characters of *alexis* (var. 2) Scop.=*icarus*, v. Rott.=*iphis*, Gerh., a pale bluish or whitish wedge-shaped mark on the upperside of the hindwings, commencing widely just inside the marginal border and pointing towards the base, ending in a point just within the discoidal area.

ι. ab. *casanensis*, Kroul., "Bull. Mosc.," n. s. iv., p. 223 (1890). *Caerulea*, Rühl, "Pal. Gross-Schmett.," p. 268 *in part* (1893). *Icarus* ab., Gillm., "Ent. Woch.," xxv., p. 113 (1908).—*Alæ anticae supra fuscae, basi vix caeruleis pulveratae, lunulis marginalibus fulvis subdeficientibus. Posticae omnes laete caeruleae, nervis nigris, punctis nigris marginalibus parvis, lunula minima fulva notatis. Subtus ut ? typica.* ♀ 16mm. Semel capta circa Casanum Augusto (Kroulikowsky).

This is a form of the ♀, the forewings slightly scaled with blue basally and with ill-developed fulvous submarginal spots; the hindwings broadly blue, with dark nervures, and with small fulvous lunules surmounting the marginal spots. The specimen mentioned by Gillmer was taken near Hirschberg, in Bohemia, in 1904.

κ. ab. *pseudocyllarus* [Verity, MS. ?]; Seitz, "Gross-Schmett.," p. 312 (1909); Rebel, "Berge's Schmett.," 9th ed., p. 70 (1909).—♀. The bases of the wings strongly blue, without orange-red submarginal spots, which are also almost entirely wanting on the undersides.

λ. ab. *caerulescens*, Wheeler, "Butts. Switz.," p. 35 (1903); Gillm., "Int. Ent. Zeits. Gub.," ii., p. 11 (1908); Seitz, "Gross-Schmett.," p. 312 (1909); Rebel, "Berge's Schmett.," 9th ed., p. 70 (1909). *Caerulea*, Tutt, "Brit. Butts.," p. 175 (*non* 176) (1896). *Icarus* ab., Steff., "Bull. Soc. Ent. Ital.," xxii., p. 336 (1900).—♀. With the colour of typical ♂ only on the basal part of the wings (Wheeler).

This is similar to *semiclara*, except that the bases of the wings are typical lilac-blue and not of the bright blue tint of the former. Restricting this name to the form with orange marginal lunules on all the wings, that with orange lunules on the hindwings only might be called *thersites-caerulescens*, that without orange lunules on any of the wings *fusca-caerulescens*.

μ. ab. *caerulea-cuneata*, Tutt, "Brit. Butts.," p. 175 (1896); Grover, "Ent. Rec.," ix., p. 312 (1897); Gillm., "Int. Ent. Zeits. Gub.," ii., p. 11 (1908).—Brown, with lilac-blue bases to wings; a wedge-shaped mark and central spot to hindwings (Tutt).

The brown form with lilac-blue bases to the wings, the discoidal lunule of the hindwings edged with pale bluish or bluish-white, and a cuneate spot running from the marginal border to the discoidal area, is not at all an uncommon form. Grover recorded a few as occurring at Guildford in 1897, and we have found it generally distributed with other forms in most British localities in which we have collected.

ν. ab. *semiclara*, Tutt, "Brit. Butts.," p. 175 (1896); Wheeler, "Butts. Switz.," p. 36 (1903); Gillm., "Int. Ent. Zeits. Gub.," ii., p. 11 (1908); Seitz, "Gross-Schmett.," p. 312 (1909).—♀. Brown, with bright blue bases to all the wings (Tutt).

This is the ♀ form in which the bases of the wings are of a bright blue colour of the tint of var. *clara*. The name was created to cover all the forms with bright blue bases, without differentiation of the presence or absence of the orange lunular margins. Restricting the name to those with orange lunules on all the wings, we might call that with orange lunules on the hindwings only *thersites-semiclara*, and that without orange lunules on any of the wings *fusca-semiclara*.

♂. ab. *thestyliis*, Kirby, "Jermyn's Butt. Coll. Vade Mecum," p. 167 (1827); Stphs., "Cat.," p. 24 (1829); Humph. and Wd., "Brit. Butts.," p. 108 (1841); Dale, "Hist. Brit. Butts.," p. 71 (1890). *Icarus* var. ♂, Stphs., "Illus.," i., p. 92 (1828).—Wings above black, with a deep blue disk, anterior margin with a slender white edge; underneath of a pale drab or brown ash-colour, terminating in a slender black line at the edge, at the base somewhat glaucous or bluish-green; fringe long and white, with shorter brown scales intermixed. Primary wings above, with a transverse discoidal black spot near the anterior margin, underneath with a discoidal wreath consisting of ten ocellated spots, black cinctured with white, of which the discoidal one is triangular; at the margin is the usual articulate band of six ocellated spots consisting of a black pupil, iris white posteriorly, interiorly orange, crowned with a black and white acute vertex. (N.B.—There is a faint trace of this band on the upperside of the wing.) Secondary wings on both sides of the margin with a similar band, the upper one consisting of six, and the lower one of eight, spots; in the latter, the first and last have no pupil, and the last but one is formed of two spots and has two pupils. In the disk of the underside is a triangular wreath consisting of 11 ocellated spots, in the centre of which is a discoidal triangular one, all black cinctured with white. A white blot connects the wreath with the marginal band (Kirby).

This is the ♀ form in which deep blue extends from the base over the disc, with orange submarginal spots on the hindwings, but with the orange only very faintly developed on the forewings, and, therefore, inclined to the *thersites-thestyliis* form (*antèa*, p. 131). Kirby's *thestyliis* var. 1, described as having "the primary wings with a distinct marginal band of orange-coloured crescents surmounted with black, and the central spot of the underside of the secondary wings blind," is really a more definite orange-lunuled form of the blue ♀ = *thestyliis*; whilst his *thestyliis* var. 2, described as being "like the preceding, but with the band of the upperside of the hindwings showing the posterior part of the iris silvery, that is with outer pale margin, is *thestyliis-albomarginata*. Humphreys and Westwood (*British Butts.*, p. 108) say that "the *thestyliis* of Jermyn is based upon large ♀ specimens in which the blue of the upper surface is much more extended than in ordinary individuals."

o. ab. *lacon*, Kirby, "Jermyn's Butt. Coll. Vade Mecum," p. 168 (1827).—Very like *P. thestyliis*, but the fringe of the secondary wings barred with brown. The primary wings underneath have a rather large kidney-shaped blackish spot cinctured obscurely with white, the concave side of which is towards the interior margin (in one wing the pupil of the kidney-shaped spot is double or interrupted in the middle); the discoidal circle consists of only eight ocellated spots, including these, arranged obliquely as it were in two bands. The secondary wings underneath are darker, and blacker at the base, the triangular wreath consists of only ten spots of which that next the costal margin is kidney-shaped with the concave side towards the disk (Kirby).

This is practically the same form as *thestyliis*, the deep blue extending from the base over the whole of the disc, a transverse black discoidal spot and marginal band surmounted with orange lunules, but only faintly on the forewings; the underside normal except as noted above. The description of the underside spots can only be rightly appreciated by reference to the description of *thestyliis* (*suprà*). We have



already (*anteà*, p. 131) noted the form in which the dark dashes enter into the basal half of the fringes in the ♂. This is evidently the main peculiarity of *Iacon*, here described as a ♀ form, in which the character, however, appears to be much rarer than in the other sex.

π. *ab. thetis*, Esp., "Eur. Schmett.," i., p. 332, pl. xxxii. (supp. viii.), fig. 2 (1777); [Prunn., "Lep. Ped.," p. 59 (1798)]; Steff., "Bull. Soc. Ent. Ital.," xxxii., p. 336 (1900); Tutt., "Nat. Hist. Brit. Butts.," iii., p. 333 (1909). *Oceanus*, Bergstr., "Nom.," iii., p. 9, pl. liii., figs. 3-4 (1779). *Caerulea*, Fuchs, "Stett. Ent. Ztg.," xxxviii., p. 133 (1877); Rühl, "Pal. Gross-Schmett.," pp. 268, 761 (1893-5); Tutt., "Brit. Butts.," p. 176 (*non* 175) (1896); Grover, "Ent. Rec.," ix., p. 312 (1897); Favre, "Macr.-Lép. Val.," p. 19 (1899); Kroul., "Rev. Russ. Ent.," iii., p. 111 (1903); Wheeler, "Butts. Switz.," p. 35 (1903); Verity, "Bull. Soc. Ent. Ital.," xxxvii., p. 28 (1905); Smallmn., "Ent. Rec.," xix., p. 41 (1907); Gillm., "Int. Ent. Zeits. Gub.," ii., pp. 1, 11 (1908); Grund, *op. cit.*, ii., p. 79 (1908); Trautm., *op. cit.*, ii., p. 162 (1908); Seitz, "Gross-Schmett.," p. 312, pl. 80g, (1909); Rebel, "Berge's Schmett.," 9th ed., p. 70 (1910). *Coerulea*, Auriv., "Nord. Fjär.," p. 14 (1888-1892); Reuter, "Macr. Finl.," p. 13 (1893); "Ent. Rec.," v., p. 276 (1894); Kroul., "Soc. Ent.," vii., p. 172 (1893).—*Alis caeruleis margine nigricante obductis, fascia maculari utrinque fulva obsoletiori subtus ocellis numerosis.* This *P. thetis* appears to be very little distinguished from *medon*, yet, in the case of living specimens, it strikes the eye at once as being something different. The brilliant blue of this shading into brown (which no art can reproduce) distinguishes it very strongly from *medon*. The ♀ has also been discovered and illustrated on pl. xxxiii., fig. 3. This at once determined it as a separate species. One often entirely fails to find *medon* in localities where this is as common as possible. Its orange-coloured band consists of fewer spots. The underside of the wings has several of them, they are in greater numbers, have a narrower bordering and are placed in quite a different manner. . . . The aberrations that I have met with are distinguished by the more or less prominent blue on the upperside; but I have never had an entirely blue one, such as von Rottemburg speaks of, come into my hands . . . . The present *P. thetis* is met with in July with us, as well as later, but only rarely; much smaller examples sometimes occur (Esper).

Borkhausen, in 1788, recognised (*Sys. Besch.*, i., p. 161) this as a form of *P. icarus*, and Esper's figure of *thetis* (pl. xxxii., fig. 2), which his description shows he thought to be a ♂, is a well-known ♀ form of this species with orange antemarginal lunules on all the wings; the ground colour fuscous, the costal margin of both fore- and hindwings dark, but the rest of the wings scaled with blue from the base to beyond the discoidals, the blue just falling short of the orange lunules; the hindwings with the interneural marginal spots edged with blue. The insect represented in pl. xxxiii., fig. 3, and referred to as the ♀, belonging to this supposed ♂, is a ♀ *icarus* without blue, but with orange spots on the upperside of all the wings. Bergsträsser points out (*Nom.*, iii., p. 9) that his *oceanus* (pl. liii., figs. 3-4) is identical with Esper's *thetis*. He also remarks on the close alliance of *thetis*, Esp. (*oceanus*, Bergstr.) with his *pampholyge* (another ♀ form of *P. icarus*, see *anteà*, p. 141), as well as *salacia* and *venilia* [two ♀ forms of *Agriades thetis* (= *bellargus*) see preceding vol., p. 344], the quantity of blue scaling leading him to question whether *thetis*, Esp., might not be the ♂ of all these various forms, as Esper had supposed, but this, of course, is not so; it is merely one of the many blue ♀ forms of the common *P. icarus*. Fuchs' *caerulea* is also referable to this form. He states that "the blue ♀ aberration of *P. icarus* is not very rare in the neighbourhood of Bornich, in both the first and second broods, the first example having been captured August 21st, 1875, whilst, at the end of May and beginning of June, 1876, he found blue ♀s in abundance." His description is identical



with that of *thetis*, Esp. = *oceanus*, Bergstr. He states that, "on the forewings, the deep blue colour extends nearly to the reddish-yellow marginal spots, whilst the black discoidal lunule is very conspicuous; the costal margin remains black, the median nervure and its branches are finely black. On the hindwings the inner (costal) margin is broadly black as far as the exterior angle, otherwise the blue colour extends as far as the marginal line, and contains the distinct reddish-yellow marginal spots, edged inwardly with black lunules, and themselves edging a series of large black spots; the nervures black towards the margin. The ♀s, he says, show a tendency to vary in the quantity of blue present; most frequently there is a blue suffusion basally in both fore- and hindwings, the latter also being blue before the margin, and extending to the reddish-yellow marginal lunules, this blue area being traversed by the black nervures." The blue aberrations of this species are probably more abundant in Britain and Western France than elsewhere, but they are also common in its northern and eastern localities, some of the Asiatic examples being very beautiful. The blue forms abound in both broods at Deal, Folkestone, and almost everywhere on the North and South Downs; Smallman says that it is the usual form of ♀ on Wimbledon Common, and Grover that fine examples of this aberration occur at Guildford. Kroulikowsky says, it is found near Sarapoul and Malmisch, as well as Urzoum in the Viatka Govt.; Rühl notes it from [Kasan], Slavonia, Wolfsberg; Nassau, Schwerin; Zürich, etc. Favre says that it occurs in Valais, along the banks of the Dranse and below la Bâtiaz; but Wheeler states that, among the hundreds of Vaudois and Valaisian *P. icarus* he has seen, not one ♀ has been blue beyond the discoidal spot and that even this is very rare. Lowe notes that the autumn examples in Guernsey often reach to *ab. caerulea*. In the south the blue forms are apparently more restricted to the early spring broods, and to be much rarer than in the north and west; in the spring brood, however, they are not uncommon in Algeria (see *infra*) and Sicily (Chapman); but Bromilow says that *ab. caerulea* appears to be rare in the Alpes-Maritimes, although examples approaching thereto appear not to be scarce in the Nice district. Verity notes it as scarce in the Vallombrosa.

♂ *ab. glauca*, Maas., "Stett. Ent. Ztg.," p. 160 (1880); Rühl, "Pal. Gross-Schmett.," p. 269 (1893). *Caerulea*, Gillm., "Int. Ent. Zeits. Gub.," ii., p. 2 (1908).—*Lycaena alexis*, common in all meadows and by country-roads. On the latter they often sit in damp places with *L. adonis* in great numbers, closely packed together. An aberration of the ♀ often occurs with blue on the upperside, analogous with the *ceronus* of *L. adonis*, and may easily be mistaken for this; also, intermediate forms between this aberration and the usual uniform brown ♀, with more or less blue, are not rare. Similar blue ♂s occur frequently in the Muckerthal. As no special name has, I believe, been given this form, I propose to call it *glauca* (Maassen).

It is difficult to know what form Maassen means by *glauca*. He says it is analogous with the *ceronus* of *L. adonis*, and might be easily mistaken for this. If one reads Esper's original description of *ceronus* (*antéa*, vol. x., p. 345) it will be seen that the main feature of this form is the row of deep red spots on the margins of all the wings, whilst the costal margin of Esper's figure [*Eur. Schmett.*, pl. xc. (cont. xl.), fig. 2] has the costa and nervures of the forewings blackish. It should, one supposes, be restricted to such examples. It appears to

be almost, if not absolutely, identical with *thetis*, Esp. = *caerulea*, Fuchs, and the name should probably be sunk as a synonym of *thetis*, Esp.

s. ab. *supracærulea*, Obth., "Etudes," xx., expl. pl. iv., fig. 46 (1896). *Icarus* ab., South, "Ent.," xx., pl. ii., fig. 11 (1887). *Icarus* ♀, Tutt, "Brit. Butts.," p. 175 (1896); Wheeler, "Butts. Switz.," p. 35 (1903). *Alexis* ab., Obth., "Etudes," xx., p. 23 (1896). *Amethystina*, Gillm., "Ent. Wochenbl. (Ins. Börse)," xxv., p. 23 (1903); "Int. Ent. Zeits. Guben," ii., pp. 1, 10 (1908); Trautn., "Int. Ent. Zeits. Gub.," ii., p. 162 (1908); Seitz, "Gross-Schmett.," p. 312 (1909), Rebel, "Berge's Schmett.," 9th ed., p. 70 (1909).—Certain regions produce very blue ♀s. Thus, in England, *alexis* ♀ is often of a rather pale, but brilliant, blue, with a very special facies. In Brittany the ♀ is sometimes blue, but the tint is darker than in the English race. Algeria, however, appears to offer the most beautiful blue type with a very wide red-spotted border. We have figured a ♀, taken at Lambessa, our no. 46 (*supracærulea*). We possess another ♀, from the same locality, less blue, but having the red marginal band still better developed (Oberthür).

This is our "lilac-blue with orange spots" form which we refer to *icarus*, Rott. (*Brit. Butts.*, p. 175). It has been questioned whether we were right in selecting this form as the type, although reference to von Rottemburg's original description of the ♀ (*antæ*, p. 115) will show that his diagnosis included a pretty wide range of aberrations. Oberthür called it *supracærulea* in his description of the plate in which the form was figured. Gillmer redescribed it, with reference to Oberthür's and South's figures, under the name of *amethystina* as "Alis supra cæruleis, fascia marginali fulva," noting (*Ent. Woch.*, xxv., p. 23) that, "for the ♀ *icarus* with entirely blue upperside and red marginal band, a new name must be chosen." [See also *Int. Ent. Zeits. Guben*, ii., pp. 1, 10.]

τ. ab. *mariscolore*, Kane, "Ent.," xxvi., p. 243 (1893).—The Irish ♀ offers the most conspicuous divergence from the normal English and Continental type, in which the basal half only is dusted with blue scales (as figured *Ent.*, xx., pl. ii., fig. 8\*), the brown of the upperside being widely replaced by a violet, or wholly by the bright, blue of *L. bellargus*. These forms are not uncommon in Ireland, in Galway, Sligo, Donegal, Antrim, Down, Westmeath, Waterford, etc., and are accompanied by a series (often almost confluent) of very bright orange peacock-eye markings on the outer margins of all wings, so that some specimens (if not too brilliant) would pass muster as the var. *ceronus* of *L. bellargus* (as figured *Ent.*, xx., pl. ii., fig. 12), another most interesting testimony to the genetic affinities of this species. This var. *ceronus* of *P. icarus* occurs in some abundance at Ballynahinch, Connemara, and at Ardrahan and other parts of Galway, as well as in some central and southern localities. The fig. 11† of South's plate ii. (*Ent.*, xx.) is not of so vivid a tint as some specimens I have taken of this beautiful aberration . . . I have not heard that this Irish form of the ♀ has been recorded as a local form from the Continent, and, as it is an important parallel variation to that of *L. bellargus* and the ab. *syngrapha* of *L. coridon*, think it may receive the varietal name of *mariscolore* (Kane).

Kane's form is, therefore, the wholly violet-blue ♀ of *P. icarus* with a strongly-developed band of orange lunules, differing only from ab. *supracærulea*, Obth. (= *amethystina*, Gillm.) in the brighter tint of its ground colour.

υ. ab. *pallidula*, n. nom. *Pallida*, Tutt, "Brit. Butts.," p. 175 (1896); Gillm., "Int. Ent. Zeits. Gub.," ii., p. 11 (1908); Seitz, "Gross-Schmett.,"

\* This is not quite accurate. In the figure to which reference is here made, the blue coloration extends to the marginal area, and has only the costal margins of the fore- and hindwings dark; nor is this description of the "normal English and Continental type" at all accurate.

† This is the *supracærulea*, Obth. = *amethystina*, Gillm., as described *suprà*.

p. 312 (1909); Rebel, "Berge's Schmett.," 9th ed., p. 70 (1909).—♀. Brown shaded all over with lilac-blue, with darker costa, pale wedge-shaped mark to hindwings, and pale blue margin bordering orange spots (Tutt).

The ground colour of this form is of a very pale brownish-grey tint, covered all over thinly with lilac-blue scales. The name *pallida* is already used for a ♂ form of this species (*antèa*, p. 136), and, as the *pallida* ♂ and *pallida* ♀ (*Brit. Butts.*, p. 175) do not occur together racially, although both are characterised by their pale lilac-blue tint, it may be well to distinguish them, hence the change of name. It has the combined *caeruleocuneata-lunulata* characters developed.

φ. ab. *angulata*, Tutt, "Brit. Butts.," p. 175 (1896); Gillm., "Int. Ent. Zeits. Gub.," ii., p. 11 (1908); Seitz, "Gross-Schmett.," p. 312 (1909); Rebel, "Berge's Schmett.," 9th ed., p. 70 (1909).—♀. Like ab. *pallidula*, but with an angulated row of pale blue spots just inside the orange marginal band of forewings (Tutt).

This is a slight modification of the *caeruleolunulata* form, the series of blue lunules edging the orange spots of the forewings being modified into an angulated series of blue spots crossing the wing just within the orange lunules.

χ. ab. *coridon*, Esp., "Schmett. Eur.," iii., p. 134 (1784); pl. lxxix. (cont. xxix.), fig. 1 (1786).—This figure is necessary in order to prevent confusion with others. The ground colour of the upperside is brown, inclining to grey, with some blue mixed; on the border is a row of black spots which, towards the disc, have a white edging, whilst, on the hindwings, this edging is half reddish-yellow. The underside is dark grey, shaded on the hindwings, however, more into yellow-brown; here also are to be seen the reddish-yellow spots as on the upperside; they are not so strongly marked on the forewings, and are entirely wanting in the ♂ (Esper).

The figure shows this to be a pale brown ♀ form of *P. icarus* (the description says mixed with blue), with white-edged marginal spots on the forewings, and well-marked discoidal lunule, and orange-red lunular band on the hindwings; whilst the underside has only one basal spot to the forewings (= *candiope*, Bergs.). It is, therefore, the *antico-albolumulata* form, a not uncommon aberration among the browner ♀ s.

ψ. ab. *biformis*, n. ab. *Icarus* gyn., Gillm., "Ent. Zeits. Gub.," xx., p. 157 (1906).—Abdomen apparently ♀. The upper surface of the right side of a beautiful blue *icarus* colour, bearing a row of marginal black spots on both fore- and hindwings, inwardly edged with red. The left side ordinary ♀, with the orange marginal band well developed. The ground colour of the right underside is lighter brown-grey than is usual in the ♀, the costal margin of the forewing broadly suffused with blue-green, as is also the hindwing, except in cell 7; the left underside is more typically brown-grey, whilst all the wings beneath have a strongly orange marginal band. Captured at Hochstedt near Hanau, July, 1904. In coll. Leonhardt (Gillmer).

#### ABERRATIONS IN BOTH SEXES.

α. ab. *transparentis*, n. ab. *Alexis* ab., "Illus. Vars. Brit. Lep.," pt. vii., pl. iii., fig. 5 (1880); "Nat. Journ.," p. 9, pl. iii., fig. 17 (1896). *Icarus* ab., South, "Proc. Sth. Lond. Ent. Soc.," 1888-9, p. 64 (1890); Dale, "Hist. Brit. Butts.," p. 70 (1890).—The wing-scaling in both sexes so thin, that the ocellated spots of the underside show clearly through the wing, so that they may be seen on the upperside.

This aberration occurs in both sexes. Mosley figures (*Illus. Vars. Brit. Lep.*, pt. vii., pl. iii., fig. 5) a ♂, so transparent that the spots of the underside show distinctly through on the upperside, the same example, formerly in the "Sam Stevens' coll.," being again figured in *The Nat. Journ.*, pl. iii., fig. 17; in it, the marginal lunules, the submedian series of spots, and the basal spots of the underside of all the wings are exhibited on the upperside. South (*Proc. Sth. Lond. Ent.*

*Soc.*, 1890, p. 64) exhibited two ♀s, one from Bishop Auckland, the other from Castle Eden, with all the undersurface marks of the forewings reproduced on the uppersurface except the central black dots. Dale also mentions (*Hist. Brit. Butts.*, p. 70) that some specimens are remarkably clear, and so transparent, that the ocelli on the underside of the wings are observable on the upperside.

β. *ab. minor*, Ckll., "Ent.," xxii., p. 176 (1889). *Alexis* ab., Gerhard, "Mon.," pl. xxviii., figs. 5a-b (1853); Stanger-Higgs, "Ent. Rec.," i., p. 35 (1890); Obth., "Etudes," xx., p. 23 (1896). *Icarus* ab., Kirby, "Trans. Ent. Soc. Lond.," 3rd ser., ii., p. cxii (1864-6); Stevens, *op cit.*, p. v (1881); Joy, "Proc. Sth. Lond. Ent. Soc.," 1886, p. 29 (1887); Mera, *op cit.*, p. 34 (1887); South, "Ent.," xx., p. 76, pl. ii., fig. 8 (1887); Sabine, *op. cit.*, p. 287 (1887); Tugwell, "Proc. Sth. Lond. Ent. Soc.," 1887, p. 40 (1888); Sabine, *op. cit.*, p. 70 (1888); Newnh., "Ent. Rec.," v., p. 12 (1894); Mason, *op. cit.*, p. 299 (1894); Moore, "Proc. Sth. Lond. Ent. Soc.," 1898, p. 102 (1899); Rbtsn., "Ent. Rec.," xiii., p. 360 (1901); Rowl.-Brown, "Ent. Rec.," xiv., p. 313 (1902); Musch., "Ent. Rec.," xvi., p. 221 (1904); Gillm., "Ent. Zeits. Gub.," xix., p. 7 (1905); Harr., "Ent. Rec.," xviii., p. 247 (1906); Tutt, "Ent. Rec.," xix., p. 228 (1907); Rayward, "Proc. Sth. Lond. Ent. Soc.," 1908, p. 97 (1909).—Wing-expanse less than 20mm. (Cockerell), with reference to Sabine's note *Ent.*, xx., p. 287.

Cockerell's name was instituted to cover all the dwarf forms of this species, which are generally of quite normal colour in both sexes. We should include, however, as *ab. minor* all the examples under 25mm. Gerhard's figure of *pusillus* ♂ (pl. xxviii., fig. 3) specially refers to the pale lilac-blue form, but he also figures the bluer-coloured dwarf form on the same plate, fig. 5. The occurrence of ordinarily coloured dwarfs in both sexes has frequently been recorded. We have taken very small examples at Cuxton, Deal, and elsewhere in Kent. Kirby notes one (*Trans. Ent. Soc. Lond.*, 1864-6, p. cxii)  $8\frac{1}{2}$  lines in expanse (Hove, July 20th). Stanger-Higgs records (*Ent. Rec.*, i., p. 35) several small examples, *e.g.*, ♂ .625 in. (Hastings, 1887), others .875 in., and .812 in. (Hastings, 1887), .95 in. (Upton, St. Leonards, 1888); Robertson says that dwarfs not measuring  $\frac{1}{16}$  in. in expanse were common at Boscombe in 1901. South notes (*Ent.*, xx., p. 76) ♀s .75 in.-.85 in. at Folkestone, and Moore records dwarfs from Folkestone Warren, in 1898; Newnham reports (*Ent. Rec.*, v., p. 12) the smallest captured at Church Stretton as  $\frac{1}{16}$  in. in expanse, and states that the smallest specimens occur at the end of July. Mason states (*Ent. Rec.*, p. 299) that, in 1894, the species was scarce at Clevedon and the few examples seen were much smaller than usual. Rayward captured (*Proc. Sth. Lond. Ent. Soc.*, 1908, p. 97) exceedingly small examples of both sexes at Reigate in 1904 and 1905; Harrison notes a ♂ captured at Birtley, 22mm. in expanse; Lowe a ♂, on the cliffs of Guernsey, in 1883, measuring only 20mm. in expanse. The following details show that the *minor* form is not restricted to any particular season, though much commoner in the July-August brood after dry hot summers, *e.g.*, Muschamp notes that the examples taken in Majorca in April, 1903, were very small and brightly coloured, not more than from  $\frac{2}{3}$  to  $\frac{1}{2}$  the size of those usually taken in France and Switzerland; Rowland-Brown on the other hand records a diminutive race found near Beaulieu (Alpes-Maritimes) on October 2nd, 1902. Mathew captured the *minor* form April 17th, 1898, at Cyprus, and June 16th, 1897, at Suda; our own specimens have been taken at Digne, April, 1897; Digne, August, 1906; Grésy-sur-Aix, August, 1906; Clelles, August, 1906; Bourg St. Maurice, August, 1898, August, 1905;

Pré St. Didier, August, 1898; Fontainebleau, August, 1899, etc. As bearing on the point that dwarf examples are sometimes strongly pigmented, Jefferys notes that very small specimens of *P. icarus*, often not larger than *Cupido minimus*, were taken in Dorsetshire in August, 1885, many of the ♂s of these smaller specimens being darker in colour than the full-sized examples. In the British Museum coll. is a very small ♀ from Rhodes (Zeller coll.), and two from Cyprus, a ♂ from Sarnaca and a ♀ not further specified (Glazenow), also two ♀s from the "Bate coll.," one taken in May at Ctima, the other in September at Platrus. Of *minor* forms showing other characteristics we may mention one noted by Gillmer (*Ent. Zeits. Gub.*, xix., p. 7) and captured July 14th, 1904, at Nikolsburg, in Moravia, 21mm. in expanse, the right forewing beneath of the form *arcuata*, the left *semiarcuata*. There is no doubt the small size may be due to two entirely different causes, besides a, perhaps, hereditary tendency to dwarfness in occasional examples, *viz.*, the placing of a larva badly with regard to food during the winter and spring, in examples of the late spring or early summer brood, and the hurrying of larvæ by high temperature (probably coupled with a somewhat sparse condition of the food) in the late summer and the autumn broods.

γ. *ab. labienus*, Jermyn, "Butt. Coll. Vade Mecum," 1st ed., p. 58 (1824); Humph. and Westd., "Brit. Butts.," p. 108 (1841). *Icarus* var. γ, Stphs., "Illus. Brit. Lep. Haust.," i., p. 92 (1828). *Eros*, Wood, "Ind. Ent.," p. 8, pl. iii., fig. 70 (1839). *Pusillus*, Gerh., "Mon. Schmiett.," p. 15, pl. xxviii., figs. 3a-c (1851); Swinton, "Ent. Mo. Mag.," xxxiv., p. 184 (1898); Gillm., "Int. Ent. Zeits. Gub.," ii., p. 178 (1908).—*P. labienus*. Antennæ black, girdled with white, their clubs being brown with black rings; wings above, pink-blue; the upper pair of wings have the anterior margin white without cilia, the exterior margin dark brown with very short cilia; the lower pair bordered with dark brown and edged with short white cilia; beneath both pairs of wings at their bases are dark with pearly scales. Upper pair with nine ocellar, six subtriangular, and six subocellar, black spots, the lower pair with eleven ocellar spots ranged in the form of a triangle, having in their centre a large triangular white spot with a black pupil; also eight triangular black marks, and seven subocellar black spots. This species has no fulvous spots beneath. Rare (Jermyn).

Humphreys and Westwood (*Brit. Butts.*, p. 108) state that they have redescribed Kirby's specimen that Miss Jermyn named *labienus*: they note it as "of very small size, not expanding more than  $10\frac{1}{2}$  lines, the upperside of a very pale lilac-blue, the spots on the underside very small, the lower spot at the base of the forewings obsolete, only five spots in the curved row beyond the middle of the discoidal cell, and the fulvous lunules almost obsolete, the two basal spots on the costa of the hindwings large and black." Although Westwood adds "I have made this description from Kirby's original specimen for which the name *Polyommatus labienus* was proposed," he does not explain why his description of the underside spotting differs from that of Miss Jermyn. Still this is a minor matter, as Humphreys and Westwood had suggested that the name should hold for all small specimens, the ♂s of which were of pale lilac-blue colour. Stephens, in 1828, had referred *labienus* to *icarus* as a form of "very pale lilac-blue colour above, the fulvous beneath very obsolete." The type was taken in a meadow at Wrabness, Essex, at the beginning of August. [Dale refers (*Hist. Brit. Butts.*, p. 71) a ♂ in his collection to this name. The specimen is now in the Hope Museum, Oxford, and agrees fairly with the description, but is of ordinary

size, *i.e.*, much larger than is allowed by Humphreys and Westwood. It is quite pallid, on the upperside tinged with lavender, and labelled "Torquay, May, 1859, T. King," the underside is also pallid, the orange very pale, and the spotting weak. J. J. Walker has a somewhat similar example taken at Galway in June, 1880, but this looks washed. Dale's example appears as if it might have been changed by light, Walker's by weather, but both were originally very pale.] It is quite clear from Gerhard's figures, which have an expanse of about 21mm., that this author's *pusillus* (*Mon. Schmett.*, pl. xxviii., figs. 3a-c) is practically the same form as *labienus* on the upperside: Gerhard notes (p. 15) that several pairs of this aberration, specially distinguished by its small size, were bred by himself in Germany, he further observes that Ochsenheimer referred to this small form (*Die Schmett.*, i., pt. 2, p. 41); he does not mention, however, that Ochsenheimer's specimen ( $\sigma$ ) had a spotted margin to the hindwings. Swinton notes (*Ent. Mo. Mag.*, 1898, p. 184) the capture of a form of *icarus* near *pusillus*, Gerh., in the neighbourhood of Jerusalem, between May 29th and July 28th, 1896, where it occurred plentifully in the gardens and vineyards during the summer. One suspects that Culot's *lucia* falls here. Oberthür observes (*Études*, xx., p. 23) that, "in Corsica, at Granada, and in Syria, one meets with extremely small *alexis*: certain  $\sigma$ s are of a very much paler blue, and have the texture of the wings as fine as has *sebrus*; he adds that Graslin had 2  $\sigma$ s and 3  $\varphi$ s from Spain smaller than the smallest *alsus*." Some years produce the form quite racially in Europe, thus, on August 18th, 1906, we found very small specimens flying abundantly with others of normal size at Digne; two days later, at Grésy-sur-Aix, all the *P. icarus* taken were of a pigmy race, and the same was true also a day or two later at Versoix; the south-eastern part of France, in the summer of 1906, was remarkably hot and dry. As showing, however, that heat and drought have not everything to do with the development of this small and poorly-pigmented form, we may add that we captured an example at le Lautaret, in the Dauphiny Alps, at an elevation of more than 7000ft., in August, 1896. It would appear that larvæ hurried through their stages, as well as those that are badly placed for a sufficiency of food may be dwarfed in size, but that, of these, some have less power to develop a strongly-marked blue pigment than others. Elwes notes (*Trans. Ent. Soc. Lond.*, 1900, p. 193) that "*L. icarus* was common at the foot of the Bulgarian mountains in 1899. A very small variety, of which the  $\sigma$ s were worn and the  $\varphi$ s fresh, was found on the northern foothills of the Balkans, and at first supposed to be *candalus*, but Staudinger considered that they were only starved specimens of *icarus*, and the great drought which prevailed in the Lower Danubian provinces during the last winter and spring, would perhaps account for their uniformly stunted development."

$\delta$ . ab. *nana*, Grund, "Int. Ent. Zeits. Guben," ii., p. 79 (1903). *Alexis* ab., Ochs., "Die Schmett.," i., pt. 2, p. 41 (1808).—From July to September, fly among the type form, strikingly small specimens of 21mm.-23mm. expanse, whilst that of typical *icarus* is from 26mm.-34mm. The  $\sigma$ s have, for the most part, like ab. *celina*, a row of small black spots before the border of the hindwing, and these small examples, which I name ab. *nana*, seemed to be confined to certain places; I take them every year in two places, *viz.*, a meadow in Maksimir and near Dolja, behind Podsused, but they are also taken in other places in Croatia, *e.g.*, at Fiume by H. Neustetter (Grund).

This is little more than a synonym of *labienus*, Jermyn, or *minor*, Ckll., except that some of the specimens are of the *minor-nigromaculata* form, to which the name must be restricted. Ochsenheimer, in 1808, recorded a ♂ not more than half the usual size with black spots along the edge of the upperside of the hindwing; several of the form having been taken in the neighbourhood of Dresden.

ε. ab. (et var.?) *parvula*, Kroul., "Ent. Nachr.," xviii., p. 370 (1893).—In the Viakta Govt. there is generally only one brood of *icarus*, but sometimes a supplementary (second) brood from 10mm.-13mm. (the normal specimens being 16mm.-21mm.) occurs. [These measurements obviously refer to one side only.] The ♂s are of a darker blue than the type, with very narrow border; underside whitish-grey, and quite white before the border; reddish-yellow spots very pale. ♀ without a trace of blue on the upperside; underside lighter brown, with much lighter marginal spots.

This should probably be considered as merely a synonym of *minor*, Ckll. We only separate it in case the special description of the underside indicates racial characteristics.

ζ. ab. *hyacinthus*, Stphs., "Cat.," p. 24 (1829); Humph. and Westd., "Brit. Butts.," p. 108 (1841). *Alexis* ab., Ochs., "Die Schmett.," i., pt. 2, p. 41 (1808). *Icarus* var. β, Stphs., "Illus. Brit. Ent.," i., p. 92 (1828). *Icarus* ab., Blach., "Ann. Soc. Ent. Fr.," pl. iv., figs. 2-3 (1889).—A dwarf form 22mm. or less in expanse, the two transverse ocelli at the base of the anterior wings beneath obliterated (Stephens and Westwood).

Ochsenheimer describes (*Die Schmett.*, i., pt. 2, p. 41) two similar small ♂s of the *icarinus* form, one from Portugal, the other from Leipzig. Blachier observes that a ♀ of this *minor-icarinus* = *hyacinthus* form, is figured in the *Ann. Soc. Ent. France*, 1889, pl. iv., figs. 2-3.

η. ab. *major*, n. ab. *Icarus* ab., Swinhoe, "Proc. Ent. Soc. Lond.," p. 340 (1885); South, "Ent.," xx., p. 76 (1887); Staud., "Rom. Mém.," vi., p. 162 (1892); Newnh., "Ent. Rec.," v., p. 12 (1894); Fuchs, "Jahrb. Nass. Ver. Nat.," liii., p. 31 (1900).—Larger in both sexes than usual, expanding more than 35mm.

Large specimens of this species are not at all rare, indeed, in some districts there is a tendency for the large size to become racial, e.g., Bourg St. Maurice, Western Ireland, the Hebrides, etc. Stanger-Higgs records a ♂ 1.58ins., taken at Upton St. Leonards (1887), a ♀ 17.5ins., Hempsted, Glos. (1889). South notes a ♂ 35mm., taken at Ventnor, another 35.5mm. captured at Sligo, whilst Newnham mentions one caught at Church Stretton 1 $\frac{9}{16}$ ins. Also reported from Amurland (Staudinger), Siberia (Fuchs), and Quetta, in the late autumn brood (Swinhoe).

#### UNDERSIDE ABERRATIONS.

α. ab. *discreta*, Tutt, "Nat. Hist. Brit. Butts.," iv., p. 16 (1910); Hodgs., "Ent. Rec.," xxii., p. 115 (1910). *Icarus* ab., Bird, "Ent. Rec.," xvii., p. 311 (1905); Hemming, "Proc. Sth. Lond. Ent. Soc.," 1909, p. 110 (1910).—The spots of the submedian series thrown back from the discoidal towards or against the marginal series, sometimes forming an almost straight line.

This form is not at all uncommon. We have excellent specimens from Chattenden, Cuxton, Deal, Dover, and other Kent localities, and from many Continental ones. Bird notes a ♀, taken August, 1904, at Tintern, the submedian spots very large, and, with the exception of the top one in a straight row, close to, and parallel with, the black-edged orange spots. Blachier notes (*in litt.*) that a ♂ of the *candiope* (*iphis*) form, taken at Eclépens on August 5th, 1907, has the spots of the submedian series thrown right back, so that the ocellated spots touch the black chevrons which surmount the orange-red marginal lunules;



the submedian spots of the hindwings are also thrown back, but less markedly. In the British Museum coll., a large ♀ from Sicily, labelled "Leech coll.," is strikingly of this form.

β. *ab. glomerata*, Tutt, "Nat. Hist. Brit. Butts.," iv., p. 16 (1910); Hodgs., "Ent. Rec.," xxii., p. 115 (1910). *Icarus ab.* Harrison, "Ent. Rec.," xviii., p. 247 (1906); Hemming, "Proc. Sth. Lond. Ent. Soc.," 1909-10, p. 119 (1910).—The submedian series of spots, together with the basal spots closing on, and forming a sort of circle round, the discoidal lunule.

Harrison notes (*Ent. Rec.*, xviii., p. 247) a ♀, with the two basal ocelli and the remains of the subterminal row of ocelli moved up to the discal area, forming a black T symmetrically on the underside of the forewings; the hindwings only possess a confused central mark. Hemming exhibited (*Proc. Sth. Lond. Ent. Soc.*, 1909, p. 119) a ♀ with the submedian spots on the underside of the forewings closely clustered round the discoidal, except that the lowest submedian spot was confluent with the lower basal spot (as in *melanotoxa*); the spots on the underside of the hindwings partially obsolete, but the three remaining spots also clustered round the discoidals (= *ab. glomerata-melanotoxa*, n. *ab.*).

γ. *ab. parvipuncta*, Courv., "Mitt. Schw. Ent. Gesell.," xi., p. 24 (1903); Gillm., "Ent. Zeits. Gub.," xviii., p. 2 (1904); "Int. Ent. Zeits. Gub.," ii., p. 134 (1908); iv., p. 2 (1910); Rebel, "Berge's Schmett.," 9th ed., p. 70 (1910). *Icarus ab.*, Adkin, "Proc. Sth. Lond. Ent. Soc.," 1894, p. 46 (1895). *Persica*, Seitz, "Gross-Schmett.," p. 312 (1909).—The basal, submedian and discoidal spots all very small (Courvoisier).

Courvoisier only notes this aberrational form as occurring in the ♂. In the British Museum coll. is a ♂ labelled "Mutzell coll.," also three examples of var. *napaea* of this form, with only traces of the basal spots on the hindwing, also two from Afghanistan, one from "Sarafschan (Grum-Grshimailo)," two labelled "Dschungaria," some of these being also *icarinus*. Adkin records (*Proc. Sth. Lond. Ent. Soc.*, 1894, p. 46) a ♂, captured at Reigate, June 9th, 1894, with the black spots of the underside much reduced in size, those usually found at the base of the forewings absent (= *ab. parvipuncta-icarinus*, n. *ab.*). The Roscrea example of *livida* (noted *anteà*, p. 136) is also of the *parvipuncta* form.

δ. *ab. albo-ocellata*, Gillm., "Soc. Ent.," xviii., p. 186 (1904); Rebel, "Berge's Schmett.," 9th ed., p. 70 (1909). *Icarus ab.*, Adkin, "Proc. Sth. Lond. Ent. Soc.," 1888-9, p. 165, pl. i., fig. 2 (1890). *Albomaculata*, Gillm., "Ent. Zeits. Gub.," xviii., no. 1, p. 2 (1904).—This form is marked by the complete disappearance of the black centres in everyone of the ocellated spots on the underside of the wings; on the other hand, the black marginal spots and the black chevrons edging the orange marginal lunules are retained, though fainter than in typical specimens. One ♂ taken at Stürzelberg (Dusseldorf), August 30th, 1903, in the Wiskott coll. Another in that of von Metzen at Dusseldorf (Gillmer).

In the British Museum coll. is a ♀ from the Engadine with minute white spots on the hindwings: the first basal being the only one pupilled, in the forewing the fourth and fifth of the submedian row and the discoidal are also pupilled, the others being barely represented (= *ab. subalboocellata*, n. *ab.*). Adkin figured (*Proc. Sth. Lond. Ent. Soc.*, 1888-9, pl. i., fig. 2) a ♂, the underside of which shows the ordinary ocelli without black kernels, but of the grey ground colour with surrounding white rings (= *ab. albocircumcincta*); the specimen was captured by Austin, in 1888, at Folkestone. This example differs apparently from Gillmer's in that in the latter, the centres also are



white, the ocelli being described by Gillmer (*in litt.*) as "pure white," although his original description does not say so. Adkin's description (*op. cit.*, p. 165) does not agree with the figure, for he says, "the usual spots absent, their place being occupied by their *blackish* rings," "blackish" being evidently a *lapsus calami* for "whitish." Adkin, unfortunately, is not now in possession of the specimen, nor can we discover who has it.

ε. ab. *nigroocellata*, n. ab. *Icarus* ab., Adkin., "Proc. Sth. Lond. Ent. Soc.," 1890-1, p. 126 (1892).—The ocellated spots on the underside without the white outside rings, leaving only the black pupils.

Adkin exhibited, at the meeting of the South London Entomological Society, held on July 9th, 1898, a specimen with the underside of a smoky-grey colour, the white rings of the ocelli being absent. In the British Museum coll. are two specimens with almost white undersides in which the spots are pure black without surrounding rings. Yerbury's ab. *livida*, from Granada (*antea* p. 136) which has a rather dark underside, is also without white rings to the spots.

ζ. ab. *semipersica*, Tutt., "Brit. Butts.," p. 175 (1896); Wheeler, "Butts. Switz.," p. 36 (1903); Gillm., "Ent. Zeits. Gub.," xviii., no. 1, p. 2 (1904); "Int. Ent. Zeits. Gub.," ii., p. 178, *in part* (1908); iv., p. 4 (1910). *Subtusminuspunctata*, Obth., "Etudes," etc., xx., p. 23, pl. iv., fig. 41 (1896).—With the spots on the hindwings more or less obsolete (Tutt).

This is almost identical with Oberthur's form noted as having "the hindwings beneath much less spotted with black than in the normal form; the spotting on the hindwings sometimes not perfectly symmetrical." The type of this form, labelled as such in our collection, was captured at "Sligo, 1891." It has on the left hindwing, the upper basal spot (ocellated), and traces (with a lens) of white scales in the position of 1, 2, 3, and 4 of the submedian series, no trace of any other of this or the basal series; on the right hindwing, the first basal spot is white (no black centre), and traces of spots 1, 2, 3, 4, and 6, are indicated by white scales. It is for all intents and purposes, so far as black-centred ocellated submedian and basal spots are concerned, of the *postico-obsoleta* form, yet the spots mentioned are not quite absent. There is a similar specimen of Grum-Grshimailo's from Sarafschan in the British Museum coll. We had supposed the name would have been sufficient to cover the whole range of obsoletely-marked hindwing examples, but this appears to be no longer so, and it is suggested that the absolutely obsoletely-marked examples on the hindwing require separate treatment! Gillmer is inclined to argue that such intermediate forms as these should not be named, but only the extreme forms, because there are so many different combinations of absent spots possible, but it is to be noted that, in nature, the number of combinations found are usually very few, and the study of the direction in which obsolescence or loss takes place very important. Whilst leaving it, therefore, for individuals to use or leave any names that we may have proposed in their own work, we still maintain that cause has not been shown against giving a collective name for a general but variable aberrative phase.

η. ab. *subobsoleta*, n. ab. *Icarus* ab., Courv., "Mitt. Schw. Ent. Gesell.," xi., p. 24, sect. b (1903); Gillm., "Ent. Zeits. Gub.," xviii., no. 1, p. 2 (1904); Fount., "Ent.," xxxvii., p. 157 (1904). *Semipersica*, Gillm., "Int. Ent. Zeits. Gub.," ii., p. 178, *in part* (1908).—With some of the ocellated spots in the submedian (and basal) row absent on the forewings or hindwings, or both fore- and hindwings.

Courvoisier divides (*Mitt. Schw. Ent. Gesell.*, xi., p. 24) his "Formæ privatae sensu strictiore" into two entirely different sections: (a) in which the ocellated basal spots fail, (b) in which spots of the submedian series fail, and suggests that this group should "comprise all those examples which have any number of spots in the submedian series between the full normal number and the absolutely obsolete form." As Courvoisier indicates in no way whatever a special name, but simply discusses in a general way, the different forms included in his "Formæ privatae," it may be well to recognise his section *b* as *subobsoleta*. Miss Fontaine notes (*Ent.*, xxxvii., p. 157) the capture of a ♂ in Amasia, in July, 1903, almost without spots on the underside. Partial absence of the spots of the submedian row, judged from the specimens in the British Museum coll., appears to be rather common in ♂s from Greece and Asia Minor. We find it rather common for specimens to be without the 6th and 7th submedian spots of the forewings, and the 2nd, 7th, and 8th in the hindwings, frequently in conjunction with the loss of certain basal spots. Reverdin notes (*in litt.*) a ♂ taken at Jussy, May 23rd, 1884, with most of the submedian dots on forewings lacking, another ♂, Voiron, June 10th, 1909, with only five submedian dots on each fore- and hindwing. Blachier mentions (*in litt.*) a ♂ taken at Bex, July 9th, 1885, almost devoid of spots on the underside, those present being 4 and 5 of the submedian series on the right forewing, and the 5th on the left forewing; the discoidal lunules and marginal lunules present. Raynor has a specimen in his collection, taken at Horsley, 18. vi. '97, in which the underside of the right forewing has only one submedian spot, and the right hindwing nothing but a single basal spot, whilst on the left forewing there are 3 submedian and 2 small basal spots. At the other extreme of loss, *i.e.*, loss of but few ocellated spots, the same writer notes that, in four specimens of the *ab. candiope* (*iphis*) in his collection, the double ocellated spot near the anal angle of the forewings is absent. This is the case in several specimens of *candiope* and *icarinus* in our own collection. A remarkable specimen, not quite *obsoleta*, is noted by Dale (*Hist. Brit. Butts.*, p. 72) as having been taken by his father in Dorsetshire, August 5th, 1826, the underside of which is of a cream colour, the usual ocellated spots absent, but replaced in the forewings by two black streaks near the centre, and, on the hindwings, by a very few minute black dots; the fulvous band of spots the same as in the type, but the marginal row of black spots wanting. It is now (1910) in the Hope Museum, Oxford, and presents an excellent mixture of *subobsoleta* and *extensa* characters.

θ. *ab. antico-obsoleta*, Tutt, "Ent. Rec.," xxii., p. 100 (1910).—The forewings without basal and submarginal spots; the spotting of the hindwings more or less normal.

This is an exceedingly rare form, of which we have seen very few examples in British collections; usually the spotting on the hindwings tends also somewhat to obsolescence.

ι. *ab. postico-obsoleta*, Tutt, "Ent. Rec.," xxii., p. 100 (1910).—*Icarus* *ab.*, South, "Proc. Sth. Lond. Ent. Soc.," 1887, p. 62, pl. i., fig. 3 (1888); Turner, *op. cit.*, 1902, p. 103 (1903). *Semipersica*, Rebel, "Berge's Schmett.," 9th ed., p. 70 (1909). *Postico-inocellata*, Gillm., "Ent. Zeits. Gub.," iv., p. 4 (1910).—The hindwings without the basal and submedian spots, the spotting of the forewings more or less normal.

This is a slight advance towards *ab. obsoleta*, from the *ab. semi-*

*persica*, Tutt. Usually, in this form, the spotting of the forewings tends also somewhat to obsolescence. South's example, captured at Ventnor, in June, 1887, had, in addition to the absence of the ocellated spots on the hindwings, only three of the submedian spots present on the forewings, whilst Turner's, captured at Banstead, in 1902, had only four of the submedian spots remaining. We have a note of one Continental example of this form, *viz.*, a Finland specimen in the Helsingfors Museum (Federley, *in litt.*).

κ. ab. *dextro-obsoleta*, n. ab. *Icarus* ab., Sabine, "Ent.," xx., p. 288 (1887).—The undersides of the left wings spotted normally, those of the right wings of the obsolete form.

λ. ab. *sinistro-obsoleta*, n. ab.—The undersides of the right wings spotted normally, those of the left wings of the obsolete form.

Both these aberrations are exceedingly rare in British collections.

μ. ab. *obsoleta*, Clark, "Ent.," xxxviii., p. 261 (1905); "Trans. City Lond. Ent. Soc.," 1905, p. 10 (1906); Pickett, "Ent. Rec.," xix., p. 243 (1907); Gillm., "Int. Ent. Zeits. Gub.," ii., p. 178 (1908); Tutt, "Ent. Rec.," xxii., p. 100 (1910). *Alexis* var. ε, Stphs., "Illus. Brit. Ent.," i., p. 92 (1828). *Lacon*, Stephs., "List," p. 24 (1829); Dale, "Hist. Brit. Butts.," p. 71 (1890). *Persica* [Staud., "Cat.," 2nd ed., p. 12, *in part* (1871);] Auriv., "Nord. Fjär.," p. 14 (1888); Rühl, "Pal. Gr.-Schmett.," p. 761 (1895); Auld, "Proc. Sth. Lond. Ent. Soc.," 1896, p. 56 (1897); Reutti, "Lep. Fn. Baden," p. 23 (1898); Gillm., "Ent. Zeits. Gub.," xvii., pp. 76, 84 (1904); Rebel, "Berge's Schmett.," 9th ed., p. 70 (1909). *Alexis* ab., Obth., "Etudes," etc., xx., p. 23 (1896). *Icarus* ab., Oldaker, "Ent.," xxxv., p. 218 (1902); xxxvi., p. 54 (1903); "Proc. Sth. Lond. Ent. Soc.," 1902, p. 111 (1903); South, "Ent.," xxxvi., p. 249, fig. (1903); Buckstone, "Proc. Sth. Lond. Ent. Soc.," 1908, p. 97 (1909). *Caeca*, Gillm., "Int. Ent. Zeits. Gub.," iv., p. 3 (1910).—The basal and submedian spots of all wings absent; the marginal lunules present with more or less developed orange chevrons, usually better developed on hind- than on forewings.

Clark's type, *obsoleta*, was almost identical with that figured by South (*Ent.*, xxxvi., p. 249, fig.). For ourselves we should have been content to have left it under the name *persica*, Bien., from which it merely differs in that the latter not only has the ocellated spots, but also the red lunules, extinct, whilst this has the red lunules more or less developed, and the ground colour of this is usually whitish-grey rather than "white," as Bienert's is described; that of the ♀ is usually fawn or grey, tinged with brown. Clark appears to have first suggested the name, possibly not knowing that *persica*, Bien., was usually applied to this form. Pickett, who also used the name, writes (*in litt.*) that his is a very perfect ♀, with only the usual central discoidal lunule on each wing, the marginal markings weak, the usual orange lunules on the outer margin of the hindwings pale yellow, the ground colour whitish-grey. Gillmer next used it (*Int. Ent. Zeits. Gub.*, ii., p. 178), stating that *persica* does not, perhaps, exactly fit our European aberration, and would, therefore, better be replaced by *obsoleta*. The form was first described by Stephens (*Illus. Brit. Haust.*, i., p. 92, var. ε) as having "all the wings beneath with a triangular discoidal spot only, the hinder margin of the anterior wings with a few indistinct dusky marks, and of the posterior with a fulvous band terminated internally with a series of black wedge-shaped spots, and externally with black dots on a white ground." The form is no doubt a comparatively rare one. South figures and describes (*Ent.*, xxxvi., p. 249, fig.) a ♀ captured by Bergman, at Lulworth Cove, in 1903; Auld mentioned a specimen (*Proc. Sth. Lond. Ent. Soc.*, 1896, p. 56) captured in the New Forest, 1896; Oldaker, a ♂ taken on Rammore

Common, June 7th, 1907 (*op. cit.*, 1902, p. 111); Buckstone, a small specimen (ab. *minor-obsoleta*) taken on the chalk slopes between Seven-oaks and Shoreham, Kent, on September 11th, 1906 (*in litt.*) (*op. cit.*, 1908, p. 97). Oberthür states (*Études*, etc., xx., p. 23) that the species sometimes lacks the black spots on the underside completely, *e.g.*, a ♂ from Besançon, taken by Fritsch, and altogether analogous with *Agriades coridon* ab. *cinnus* (*i.e.*, ab. *corydonis*, Bergstr.). Almost all the possessors of this form describe their specimens as having weak marginal spots on the forewings, and the colour pale, so that there can be, one feels, no essential difference between *obsoleta*, Clark, and *persica*, Bienert. We still think it would have been wise to include them under the same name.

*v.* ab. *persica*, Bien., "Lep. Ergebnisse," p. 29 (1870); Staud., "Cat.," 2nd ed., p. 12, *in part* (1871); Rühl, "Pal. Gross-Schmett.," p. 268 (1893); Tutt, "Brit. Butts.," p. 175 (1896); Lamb., "Pap. Belg.," p. 232 (1902); Rebel, "Berge's Schmett.," 9th ed., p. 70 (1909).—*Alis subtus albidis, punctis ocellaribus et maculis rubris extinctis* (Bienert).

Bienert, after describing this form thus, goes on to add that "this is a very distinct aberration, agreeing on the upperside with the type from north and central Europe; the underside differs, however, essentially, the ground colour being nearly white, the central row of eye-spots wanting, the marginal spots scarcely showing, the red lunules reduced to pale shades, the white streak in cells three and four quite unrecognisable." He further states that "other examples have sharply defined black marginal spots, although the red lunules are scarcely indicated," and that these "occur with examples of the typical form at Nishapur, Ssábsevar, Chanlug and Meshet, from May to July." There are, in the British Museum coll., a large number of specimens from different parts of Persia, mostly typical and offering no real difference from European. Occasionally, in Persia and Syria—Askhabad, Tekke, Afka—however, a ♂ form occurs as a rare aberration with whitish underside, weak spotting, grey marginal lunules, and weak orange lunules; this form becomes racial farther east in Afghanistan, etc., and it is a rare aberration of this form, with the ocellated and red spots extinct, that Bienert describes. We suspect that the aberration is as rare in Asia as in Europe, and is not essentially different (except probably its whiter ground colour) from the ab. *obsoleta* already described. If it is to be retained separately as an aberration distinct from *obsoleta*, it can only be as a quite analogous Asiatic form of paler ground colour on the underside. We find no other essential difference whatever. The synonymy references we give refer to *persica* as an Asiatic form, not as noted (*Int. Zeits. Guben.*, iv., p. 3) under the name of *caeca*, to a Central European form.

[*§.* ab. *vacua*, Gillm., "Int. Zeits. Gub.," iv., p. 4 (1910).—Entirely without markings on the underside; without submedian and basal eyespots, without discoidal lunules, without marginal spots, without orange lunules, and without black bordering chevrons (Gillmer).]

Gillmer gives no data concerning the existence of any specimen agreeing with the description, indeed, he positively states that he knows of none, so that the name has no standing, being applied to a purely hypothetical aberration. Those examples with a discoidal (or traces of it) on the forewings, Gillmer says, are "only to be regarded as transitions to ab. *vacua*, which is not known as an ab. of *P. icarus* at all, but of *A. coridon*" [*i.e.*, our already named *obsoletissima* (*antéa*,

p. 18)]. He states that the example figured by South (*Ent.*, xxxvi., p. 249) agrees with *ab. persica*, Bien., except that the underside of the hindwings are more strongly marked, as is also the bordering of the orange spots towards the base, whilst the discoidal lunule of the forewing tends to obsolescence, that of the hindwing being completely absent. He then goes on to say that this forms a transition to the entirely spotless form *vacua*, which occurs in *A. coridon*, and that, since the discoidal spots of the forewings have not yet wholly disappeared, the English specimen can only be regarded as a transition to *ab. persica*, which, in its turn, has not yet arrived at *ab. vacua*. In the list of aberrations following, Gillmer does not give *vacua*, but only transition to *ab. vacua* (with description of South's transitional form).

o. *ab. icarinus*, Scharf., "Scriba's Journ.," p. 216 (1791); Meig., "Schmett. Eur.," ii., p. 25, pl. xlviii., figs. 2a, b (1830); Hdnrch., "Lep. Eur. Cat. Meth.," p. 14 (1851); Bien., "Lep. Ergeb.," p. 29 (1858); Staud., "Cat.," 1st ed., p. 5 (1861); 2nd ed., p. 12 (1871); Kirby, "Syn. Cat.," p. 365 (1871); Peyerim., "Lép. Als.," 1st ed., p. 9 (1871); Curò, "Bull. Soc. Ent. It.," v., p. 111 (1874); Dubois, "Lép. Eur.," p. 31 (1874); Weil., "Schmett. Innsbr.," p. 9 (1877); Weym., "Jahresb. Ver. Elb.," p. 55 (1878); Sand, "Lép. Ber. Auv.," p. 6 (1879); Staud., "Hor. Soc. Ent. Ross.," xiv., p. 243 (1879); Kirby, "Eur. Butts.," p. 48 (1879); Weil., "Schmett. Tauf.-Thal.," p. 13 (1880); Frey, "Lep. Schweiz.," p. 18 (1880); Peyerim., "Lép. Als.," 2nd ed., p. 24 (1880); Lang, "Trans. Ent. Soc. Lond.," p. xxxii (1881); "Butts. Eur.," p. 117, pl. xxv., fig. 5 (1884); Schilde, "Ent. Nachr.," x., p. 368 (1885); Kane, "Eur. Butts.," p. 43 (1885); Lampa, "Ent. Tids.," vi., p. 14 (1885); Adkin, "Proc. Sth. Lond. Ent. Soc.," 1886, p. 59 (1887); South, "Ent.," xx., p. 75, pl. ii., figs. 4, 5 (1887); Auriv., "Nord. Fjär.," p. 14 (1888); Christoph., "Rom. Mém.," v., p. 7 (1889); Walk., "Trans. Ent. Soc. Lond.," p. 373 (1890); Dale, "Hist. Brit. Butts.," p. 71 (1890); Warb., "Ent. Rec.," i., p. 329 (1891); Adkin, "Proc. Sth. Lond. Ent. Soc.," 1890-1, pp. 126, 170 (1892); Brom., "Butts. Riv.," p. 37 (1892); Kroul., "Soc. Ent.," vii., p. 172 (1893); Reut., "Act. F. Fenn.," p. 13 (1893); Rühl., "Pal. Gross-Schmett.," i., pp. 268, 761 (1893-5); Newnh., "Ent. Rec.," v., p. 12 (1894); Tutt, "Brit. Butts.," p. 175 (1896); "Ent. Rec.," viii., p. 255 (1896); Kirby, "Hndbk.," etc., p. 96 (1896); Mosley, "Nat. Journ.," vi., p. 9 (1896); Tutt, "Ent. Rec.," ix., p. 80 (1897); Kane, "Ent.," xxvi., p. 242 (1899); Favre, "Lép. Val.," p. 19 (1899); Staud., "Cat.," 3rd ed., p. 85 (1901); Fleck, "Macr.-Lep. Rumän.," p. 21 (1901); Lamb., "Pap. Belg.," p. 38 (1902); Wheeler, "Butts. Switz.," p. 36 (1903); Tutt, "Ent. Rec.," xv., p. 289 (1903); Kroul., "Rev. Russ. Ent.," iii., p. 111 (1903); Courv., "Mitt. Schw. Ent. Gesell.," xi., p. 24 (1903); Gillm., "Ent. Zeits. Gub.," xviii., p. 3 (1904); Siepi, "Lép. Bouches du Rhône," p. 39 (1904); Verity, "Bull. Soc. Ent. Ital.," xxxvi., p. 138 (1904); Harr., "Ent. Rec.," xviii., p. 247 (1906); Lamb., "Cat. Lép. Belg.," p. 425 (1907); Verity, "Bull. Soc. Ent. Ital.," xxxviii., p. 28 (1907); Grosv., "Proc. Sth. Lond. Ent. Soc.," 1907, p. 93 (1908); Grund., "Int. Ent. Zeits. Gub.," ii., p. 79 (1908); Gillm., *op. cit.*, p. 178 (1908); Trautm., *op. cit.*, p. 162 (1908); Bell, "Ent. Rec.," xxi., p. 227 (1909); Heuss, *op. cit.*, p. 236 (1909); Rebel, "Berge's Schmett.," 9th ed., p. 70 (1909); Fritsch, "Berl. Ent. Zeits.," liv., p. 234 (1910); Gillm., "Int. Ent. Zeits. Gub.," iv., p. 4 (1910). ? *Aleris* var. 1, Scop., "Ent. Carn.," p. 179 (1763). *Medon*, Esp., "Schmett. Eur.," i., p. 330, pl. xxxii. (cont. viii.), fig. 1 (1777). *Icarus* var., Esp., "Schmett. Eur.," i., pt. 2, p. 29, pl. lv. (cont. v.), fig. 5 (1778). *Aleris* var.  $\beta$ , Stphs., "Illus. Brit. Ent.," i., p. 92 (1828). *Escheri*, Evers., "Faun. Volg.-Ural.," p. 52 (1844). *Aleris* *ab.*, Ochs., "Schmett. Sachs.," p. 330 (1805); H.-Sch., "Sys. Bearb.," i., p. 120, pl. lii., fig. 246 (1842); vi. (app. to vol. i.), p. 26 (1853). *Aleris*, Fr., "Neu. Beitr.," vii., p. 133, pl. 676, figs. 1-2 (1858); Bell. de la Chav., "Ann. Soc. Ent. Fr.," ser. 3, vi., p. 308 (1858). *Thersites*, Bdv., "Gen. et Ind.," p. 11 (1840); Dup., "Cat. Lép. Fr.," p. 32 (1844); Gerh., "Mon. Schmett.," p. 15, pl. xxviii., figs. 2a-c (1853); Mén., "Cat. Mus. Petr.," p. 57 (1855). *Theristes*, Staud., "Cat.," 1st ed., p. 5 (1861). *Icarus* *ab.*, Nolck., "Lep. Fn. Estl.," p. 56 (1868).—Esper's fig. 5, on pl. lv., must be separated from *icarus* as a distinct species; it lacks the two ocellated spots at the base beyond the discoidal stigma in both sexes. This essential difference has given occasion for its being separated by later observers

from *icarus* and named *icarinus*\*, under which name, or some other if preferred, it must for the future be listed (Scharfenberg).

Esper's *medon* [Schmett. *Eur.*, i., pl. xxxii. (cont. viii.), fig. 1] appears to be the first certain figure of this form, although there is not much doubt in our own mind that it is also Scopoli's *alexis* var. 1 (*Ent. Carn.*, p. 179). As we however, used (*antea*, p. 141) Esper's name, *medon*, for the upperside form of the ♀ with bright orange spots on all the wings, we are retaining the name *icarinus* for this aberration. It is widely distributed, apparently, throughout the range of the species, in some places rare, in others as common as the typical form, whilst, in others, again, it is much more common, and almost racial. It occurs in both sexes, and hence the early authors often insisted on it being a distinct species, in spite of v. Rottemburg's warning that "differences in the spotting of the underside of forms of this species should not be assumed to denote specific difference." Thus Freyer (*Neu. Beiträge*, vii., p. 133) gives a long account of this form under the name *alexius*; Gerhard (*Mon. Schmett.*, p. 15), under Boisduval's name *thersites*; but Esper, Stephens, and other authors, have dealt with it as an aberration of *P. icarus*, and since the publication of Staudinger's *Catalog*, 1st ed., in 1861, no attempt has been made to maintain it as a separate species. The aberration occurs, usually not commonly, all over the British Isles with the type, in Kent, Surrey, Sussex, Hants, Devon, Herts, etc., in the south, in both sexes and in both broods; it occurs on the slope of the Ragleth, in Shropshire, in the midlands; in Durham, etc., in the north of England; at Rannoch, etc., in Scotland; Sligo, Markree, Castletown, Co. Cork, and elsewhere, in Ireland, but here also, Kane says, only occasionally with the type. T. B. Fletcher notes (*in litt.*) the capture, on June 4th, 1904, of two ♂ ab. *icarinus* and one ♂ ab. *candiope* (*iphis*) at Rame Head, Cornwall, whilst, at the same place, on June 25th, 1904, two out of four examples captured were of the ab. *icarinus*; this form is recorded from Folkestone, September 11th, 1909 (Bell), and ♂ s from Munden, Herts, September 1st, 1909 (Reuss). In most parts of France, it occurs occasionally with the type, but in other parts, *e.g.*, in the lower valleys of the Dauphiny Alps—Bourg d'Oisans, Bourg d'Aru, La Grave (August, 1896), at Clelles (July 30th-August 3rd, 1906), etc., the form is abundant and almost racial in both sexes; at Cannes it is common (Warburg), occurs with the type at Nice, and is abundant to the north of Grasse (Bromilow). We found it in both sexes in the spring at Draguignan (May 2nd-6th, 1905), Pont du Gard (May 9th, 1905), ♂ s at Auribeau (end of April, 1898), and at Digne (mid-April, 1897). It occurs at le Lautaret at an elevation of 7000 ft., at Digne in the April and August broods (August 18th, 1906), at Abriès (August, 1900), in both sexes between Colmars and Allos, etc. It is very abundant in both sexes in some seasons at Grésy-sur-Aix (July 21st, 1897, August 21st, 1906), at Bourg St. Maurice (August 1st-7th, 1898, August 1st-5th, 1905). Bellier reports (*Ann. Soc. Ent. Fr.*, ser. 3, vi., p. 308), on Guenée's authority, that the form was not rare

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\* It would seem from this that the name *icarinus* was already in use when Scharfenberg wrote, but no earlier publication of the name is known, and the earliest references to the name refer it to Scriba's *Journal*, p. 216, and assign it to Scriba, who, however, did not write this article in his *Journal*, p. 216, the name *icarinus* occurring in a paper by Scharfenberg.

around Châteaudun, and we took it in Fontainebleau Forest in August, 1899, ♂ s only. Other French localities are—Eure—Pont de l'Arche, ♀, very rare; at Léry (Dupont); Eure-et-Loir—le-Mée, Auneau, etc. (Guenée); Haute-Garonne (Caradja); Indre—Nohant (Sand); Loir-et-Cher—between Nonan-sur-Loire, and Blois (Moore), forest of Blois, very rare, May (Chevillon); Maine-et-Loire—rather rare (Delahaye); Nord—common with the type (Paux); Seine—near Paris (Berce); Saône-et-Loire—with the type. (André); Var—Hyères (Rowland-Brown); Vienne—Châtellerault, and on to Vivonne (Moore). We also found the form commonly, particularly among the ♂ s, in Piedmont at Pré St. Didier, Courmayeur (August 13th, 1898), Susa (August, 1897), and Chatillon (August 19th, 1905), whilst Verity reports it as occurring on the Lucca coast, and says that it is scarce in the Vallombrosa; a ♂ in the British Museum coll. is labelled “Foligno (Zeller),” another, “Florence” (Elwes), and there is also a ♀ from Oulx (Godman and Salvin). Favre says that it only occurs singly with the type in Valais—at Aigle, Martigny, Fully, Evolène, Sierre, near Visp, Zermatt, Naters, Bérisal, Simplon, etc., but we found ♂ s of this form commonly between Vex and Useigne on August 13th, 1903, and Wheeler reported it, in 1898, in the gorge of Veraye, behind Veytaux, as commoner than the type, although generally, in Switzerland, the form seems to be comparatively rare, as Frey also notes for Zürich, Basle, etc. We took a ♀ at Stalden, August 13th, 1909, and Poulton has another captured between Visp and Stalden, July 22nd, 1898, but we took ♂ s only at Basle, July 23rd, 1904, Evolène, August 4th-11th, 1899, in the Via Mala, August 23rd, 1909, and Santa Maria in the Munsterthal, August 14th, 1908; it is further recorded from San Stefano, in Ticino, May 22nd, 1894 (Knecht). A ♂ in the British Museum coll. is labelled “Tinzolo, 5000ft. (Elwes),” and a ♀ from the Valais (Anderegg). In Spain, generally, it is reported as being rare, *e.g.*, in the Cerro de la Carbonera (Zapater), Puerto de la Losillo (Korb), Gibraltar (J. J. Walker), and there is one in the Hope Museum, Oxford, taken at Barcelona. T. B. Fletcher notes (*in litt.*) that he captured an example of *icarinus* ♂, April 20th, 1901, the only specimen seen at Corfu; another (out of twelve examples examined) on June 3rd, 1901, at Suda Bay, Crete, another ♂, June 25th, 1902, at Larnaka, in Cyprus (when seven typical ♂ s and ♀ s were also taken), whilst, on July 10th, 1902, in Corfu, where the species was abundant, a large proportion of the examples seemed to be of this form. In Scandinavia it usually only occurs rarely, *e.g.*, Bödö (Nicholson), Abisko (Rowland-Brown), etc.; but Schilde notes (*Ent. Nach.*, x., pp. 368-369) that, in June, 1879, at Bödö, ten per cent. were of the *icarinus* form, an apparently very unusual percentage. In Belgium it occurs, but rarely, with the type, *e.g.*, at Theux, etc. (Lambillion). It also occurs rarely with the type throughout Germany and Austria, *e.g.*, Baden—Freiburg, Weinheim; Wurttemberg—Gotha; Anhalt—Schwerin; Rhine Provinces—Elberfeld, etc. In Hungary, Aigner records it rarely from Budapest, Pozsony, Poprád, Golniczbánya, Eperjes, Nagyszeben, and Lipik. In the Tirol we have taken it in various places, *e.g.*, Mendel, July 27th, 1898, in the Samthal, August 7th, 1909, Neu Spondinig, August 12th, 1909, and a ♂ from Vienna (Elwes) is in the British Museum coll., etc. In the Baltic Provinces, Nolcken



states that specimens in which both basal spots are wanting are frequently found. In the Viatka govt., it is noted as very rare (Kroulikowsky), but, in the Ural provinces, Eversmann, who records it under the name *escheri*, says that it occurs not uncommonly with the type. In Asia Minor, Staudinger notes it (*Hor. Soc. Ent. Ross.*, xiv., p. 242) as occurring in the Tschirtschir Gorge, as early as May 10th, and adds that it later appeared in certain places in predominant numbers, but also, in other places, freely among the type without being specially abundant. It is noted in the *Romanoff Mémoires* as being almost as abundant as the type in Transcaucasia, but Holtz only found it (*Ill. Woch. für Ent.*, ii., p. 47) singly, in Cilicia, in all the different broods. Two ♂s in the British Museum coll. are labelled "Persian mts. (Elwes)," whilst four examples (♂s and ♀s) noted "N.-W. Persia, Seir, 8 m. west of Urumiah, August 16th, 1898 (R. T. Günther)," and erroneously labelled "*persica*," all incline to the *discreta* form, the submedian spots well-developed, the orange of both sexes bright, but otherwise typical *icarinus*, illustrating the absurdity of supposing that the Persian examples generally are referable to the remarkable ab. *persica*, Bien.; another ♀ in the same collection is from "Teheran (Miss Jourdain)," another from the "Cedars of Lebanon (Mrs. Nicholl, May, 1900)," whilst one bears the remarkable legend "Hybrid *astrarche* × *icarus*: Vindebona." Christoph observes (*Rom. Mém.*, v., p. 7) that Leder found it in great numbers near Askhabad, whilst the examples in the British Museum coll., captured by Grum-Grshimailo, in June and August, 1892, in Sarafschan, incline strongly to the *icarinus* and *candiope* (*iphis*) forms. Herrich-Schäffer's fig. 246, representing a ♂ taken by Bischoff, near Constantinople, is of the *icarinus-discreta* form; the author referring to the position of the submedian row of spots, in his vol. i., p. 120. One example in the British Museum coll. from Bergün is of the *icarinus* form on the left side only, just like that noted by Bell as *semi-icarinus* (*Ent. Rec.*, xxi., p. 227) captured at Folkestone, September 11th, 1909.

o<sub>2</sub>. ab. *bion*, Reb., "Berge's Schmett.," 9th ed., p. 70 (1909).—Ocellated spots smaller, the basal spots of the forewings absent, the ordinary reddish-yellow marginal spots entirely absent; on the other hand a long white streak on nervure M<sub>3</sub> of the hindwing reaches towards the base. A ♂ from the Bisamberg near Vienna (Rebel).

A combined form of *icarinus* and *parvipuncta*, with the usual fulvous spots obsolete; and the white streak on the underside of the hindwings well marked.

π. ab. *candiope*, Bergs., "Nom.," ii., p. 78, pl. xlviii., figs. 3-4 (1779); Göze, "Ent. Beit.," iii., pt. 2, p. 80 (1780). *Iphis*, Meig., "Eur. Schmett.," ii., p. 25, pl. xlvii., fig. 5 (1830); Hdnrch., "Lep. Eur. Cat. Meth.," p. 13 (1851); Gerh., "Mon.," p. 15, pl. xxviii., figs. 1a-c (1852); Meyer-Dür, "Schmett. Schweiz," p. 80 (1852); Kirby, "Syn. Cat.," p. 365 (1871); Weym., "Jahresb. Ver. Elb.," p. 55 (1878); Dale, "Hist. Brit. Butts.," p. 71 (1890); Rühl, "Pal. Gross-Schmett.," i., p. 760 (1895); Tutt, "Brit. Butts.," p. 175 (1896); Staud., "Cat.," 3rd ed., p. 85 (1901); Lamb., "Pap. Belg.," p. 231 (1902); Wheel., "Butts. Switz.," etc., p. 36 (1903); Kroul., "Rev. Ent. Russ.," iii., p. 111 (1903); Gillm., "Ent. Zeits. Gub.," xviii., p. 3 (1904); Grover, "Ent. Rec.," ix., p. 312 (1907); Grund, "Int. Ent. Zeits. Gub.," ii., p. 79 (1908); Gillm., *op. cit.*, p. 178 (1908); Fritsch, "Berl. Ent. Zeits.," liv., p. 234 (1910); Gillm., "Int. Ent. Zeits. Gub.," iv., p. 4 (1910); Rebel, "Berge's Schmett.," 9th ed., p. 70 (1910). [*Coridon*, Esp., "Schmett. Eur.," pl. lxxix. (cont. xxix.), fig. 1 (1786).] *Icarus* ab., Nolck., "Lep. Fn. Estl.," p. 56 (1868); Bird, "Ent. Rec.," xviii., p. 280 (1906).—*P.P.R. alis rotundatis integerrimis fuscis fulvo-utrimque maculatis*,



subtus cinerascens. With rounded uniform brown wings and a series of red-yellow submarginal spots on both sides of all the wings; the underside ashy-grey. It is a ♀, but to which ♂ does it really belong? Is it Scopoli's *alexis*? (Bergsträsser).

Borkhausen recognised (*Sys. Besch.*, i., p. 161) this as a form of *P. icarus*. Bergsträsser's figure represents a ♀ with upperside brown, the bases of all the wings tinged with blue, and yellowish-fulvous submarginal bands to all the wings. The underside of the forewings, however, has only one basal spot. The form has been generally known as *iphis*\*, Meig., whose examples came from the Baumhauer coll., as also did those figured by Gerhard, 22 years later, probably (in spite of the difference in colour tint) the same examples. Esper first figured this aberration as *coridon* [*Schmett. Eur.*, i., pl. lxxix. (cont. xxix.), fig. 1] the name being utilised (*antea*, p. 148) for an upperside form. Either the top or bottom basal spot may be absent. In our experience, it appears to be a rarer form than ab. *icarinus*, although, in England, as on the Continent, it occasionally occurs in almost all localities with the type. We have taken it in most of the localities in which we have collected, and, of thirteen ♂s of this form captured at Deal in August, 1887, ten have the lower and three the upper spot absent. Cuxton, Chattenden, Sligo, etc., provide other examples. Norgate notes (*in litt.*) that, at Sparham, in Norfolk, the upper of the basal spots on the underside of the forewings is usually the more distinct, several examples having the lower of these spots without a black centre and almost obsolete, so that they scarcely reach the *candiope* (*iphis*) form. The ab. *candiope* is recorded from Guildford (Grover), ♂, Tintern, August 16th, 1906 (Bird), etc. We have Continental specimens labelled—♂, Via Mala, August 23rd, 1907; ♂, Santa Maria, in the Munsterthal, August 14th, 1908; ♂, Staefa Bog, July 27th, 1908; ♂, Fontainebleau, August, 1899; ♂, Bourg d'Aru, August, 1896; ♂, Bourg St. Maurice, August 1st, 1905; ♂, Digne, August 4th, 1906, etc. It is noticeable that every example here recorded is ♂. Weymer records it as occurring frequently at Elberfeld with the type. Kroulikowsky says that it occurs in the Viatka Govt. of Russia. In the British Museum coll. are ♂s from Preston, Londonderry; Cyprus; Askhabad, Sarafschan; Hyères (Yerbury); Norway—Odalen, right side only, the second spot just visible on left side. In other examples, the basal spotting is mixed—(1) typical one side, *icarinus* the other = *semiicarinus*, Bell, (2) typical one side, *candiope* the other = *semicandiope*, n. ab., (3) *icarinus* one side, *candiope* the other = ab. *mixta*, n. ab. We have examples of all these forms taken at Deal in August, 1887, others from Cuxton, whilst Smallman notes (*Ent. Rec.*, xix., p. 41) the capture of two ♂s and one ♀ on August 13th, 1906, on Wimbledon Common, in which the underside of the left forewing is typical and

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\* Brilliant light blue with brown outer margin, and pure white fringes; beneath ashy-grey with black ocellated spots and a spotted reddish-yellow marginal band towards the outer margin of hindwings. The ♂ is not of so vivid a tint as in *bellargus* and *alexis*, but more mixed with white and with a reddish tinge; a tolerably broad blackish-brown outer marginal band, which, on the hindwings, usually takes the form of spots. The outer portions of the nervures blackish. The body light blue and hoary. The antennæ ringed black and white with a black club and white apex. The fringes white throughout. The underside ashy-grey, almost identical with that of ♂ *icarus*, but there is only one basal ocellated spot on the forewing. Figured from a specimen in Baumhauer's coll. (Meigen).

the right of the *candiope* (*iphis*) form. We have similar specimens from the Dischmathal, August 3rd, 1908, Sertigthal, August 5th, 1908, Saas-Grund, August 8th, 1904, Balen, August 7th, 1904. Poulton also took a specimen of this *semicandiope* form at Brieg, July 24th, 1898.

*p. ab. crassipuncta*, Courv., "Mitt. Schw. Ent. Gesell.," xi., p. 19 (1903); Gillm., "Ent. Zeits. Guben," xviii., p. 1 (1904); "Int. Ent. Zeits. Gub.," ii., p. 154 (1908); Rebel, "Berge's Schmett.," 9th ed., p. 70 (1910). *Icarus ab.*, Turner, "Proc. Sth. Lond. Ent. Soc.," 1902, p. 108 (1903).—The spots of the submedian and basal series on the underside of the wings strikingly enlarged (Courvoisier).

As a marked aberration this does not seem to be a common form; the average size of the spots varies considerably in different districts, and hence fairly large-spotted examples may become racial. It occasionally occurs as an aberration among normal examples, *e.g.*, Turner exhibited (*Proc. Sth. Lond. Ent. Soc.*, 1902, p. 108) a ♀, taken at Banstead, with the submedian spots much enlarged and intensified, and most of our best British collections contain specimens.

*s. ab. excessa*, Gillm., "Int. Ent. Zeits.," ii., p. 178 (1908). [*Candaon*, Bergstr., "Nom.," iii., p. 3, pl. xlix., figs. 3-4 (1779).] *Icarus ab.*, Courv., "Mitt. Schw. Ent. Gesell.," xi., p. 23, pl. ii., fig. 7d (1903); Gillm., "Ent. Zeits. Gub.," xviii., p. 1 (1904); Leonh., "Ent. Zeits. Gub.," xviii., p. 53 (1904); Bird, "Ent. Rec.," xviii., p. 280 (1906). *Addenda*, Tutt, "Ent. Rec.," xxii., p. 51 (1910).—Supernumerary spots appear between the discoidal lunule and the arcuate row, or in and close to the latter (Gillmer).

This form was first figured by Bergsträsser under the name of *candaon*, which is, however, also characterised as a wide-margined form on the upperside (see *antea*, p. 137). Gillmer gives no indication of the locality or date of capture of his type, nor does Courvoisier, who says (*Mitt. Schw. Ent. Gesell.*, xi., p. 23) that it occurs in both ♂ and ♀. Our reference was based on a single specimen with a small extra ocellus between the discoidal and the 2nd spot of the submedian series; Bird notes also a ♀ taken August 21st, 1906, with an extra ocellated spot on the left forewing between the discal spot and the top one of the submedian series. Bergsträsser's figure of *candaon* (*Nom.*, iii., pl. xlix., figs. 3, 4) again gives only a single spot. In the British Museum coll. is a ♀ with an extra spot on the left wing just below the discoidal; it has also the lower basal spot elongated, and an extra spot just below it. There does not appear to be another example in the whole of the British Museum coll., and we possess no other than the one mentioned, although we have had almost 1000 specimens under observation. Leonhardt describes (*Ent. Zeits. Gub.*, xviii., p. 53) a ♀, with the submedian spot between nervures II<sub>4</sub> and II<sub>5</sub> of the underside of the forewings elongated towards the discoidal, whilst between the last and the curved row there are, on each wing, two extra white-bordered dots; the specimen was taken near Hünningen (Upper Alsace), June 5th, 1903. Blachier writes (*in litt.*): "Extra spots are pretty frequent on the underside of the forewings, rarer on the hindwings; usually placed between the discoidal and the 3rd and 4th submedian; one ♂ *icarinus* has 2 supernumerary points, one just within point 1 and another just within 2, in the submedian series on the two forewings; a ♀ has two extra ocellated spots between the wing-base and the 1st basal point on the two forewings; a ♀ of the *crassipuncta* form, in addition to showing the *semiarcurata* characters, has also the upper basal point prolonged into a streak that just falls short of the discoidal,

and four supernumerary dots—two between the discoidal lunule and submedian series, and two between the two parts of the *semiarcuata* mark. In Raynor's coll. is an almost similar ♀, taken at Colchester, of combined *crassipuncta*, *semiarcuata* and *excessa* forms (= *ab. combinata*). On the underside of the left forewing of this example are three small extra ocellated spots between the discoidal and submedian series, three similar ones, but fainter, on the right forewing, another between the base of the discoidal and the spots forming the *semiarcuata* mark.

τ. *ab. transiens* [., Obth., "Etudes," etc., xx., p. 23, expl. pl. iv., fig. 42 (1896)]. *Icarus* ab., Turner, "Ent. Rec.," vii., p. 95 (1895); "Proc. Sth. Lond. Ent. Soc.," 1895, p. 50 (1896); Wheeler, "Ent. Rec.," xii., p. 5 (1900). *Striata*, Wheeler, "Butts. Switz.," p. 36 *in part* (1903).—Sometimes this species varies in the very considerable development of the black spots, especially in the forewings, thus forming a transition to the *subtusradiata* form (Oberthür).

If it be argued that Oberthür does not really describe this form as *ab. transiens*, we are willing to become responsible for it. This is really an advance on *ab. crassipuncta*, in which the submedian (and sometimes basal) spots are no longer round, but assume a long oval or pyriform, or cuneiform shape, pointing towards the discoidal. Oberthür's figure, which he describes as "*ab. transiens ad ab. radiatam*," is made from a specimen that came from Cancale, and shows no extension in the spots of the hindwing except the first submedian, although all the spots in the submedian and basal series of the forewings are extended. Blachier notes one from near Geneva. Turner notes (*Ent. Rec.*, vii., p. 95) a specimen taken at Clandon in 1895, in which the submedian row of spots on the underside of the forewings is prolonged into dashes. Wheeler mentions (*Ent. Rec.*, xii., p. 5) a ♂ with the submedian series of spots prolonged into a series of dashes, taken at Veytaux, July 1st, 1899.

ν. *ab. postico-extensa*, n. ab.—The submedian row of spots (sometimes also the basal) of the hindwings elongated into oval, pyriform, or cuneiform streaks, the spotting of the forewings normal.

Just as *ab. transiens* is really the *antico-extensa* form of this species, with the submedian spots of the forewings only elongated, so this has only the submedian spots of the hindwings similarly elongated.

φ. *ab. obsoleta-posticoextensa*, n. ab. *Lacon*, Humph. and Westd., "Brit. Butts.," p. 108 (1841).—The submedian and basal spots of the forewings absent; the submedian ones (on the hindwings) developed into a series of black wedge-shaped spots.

This must be a very rare form; we have never seen an example agreeing with Humphreys' and Westwood's description.

χ. *ab. extensa*, n. ab. *Alexis* ab., Mosl., "Illus. Vars. Brit. Lep.," pt. vii., pl. iii., fig. 5 (1880); Neave, "Ent.," xviii., p. 328 (1885); Mosl., "Nat. Journ.," pl. iii., fig. 16 (1896). *Icarus* ab., Smith, "Proc. Sth. Lond. Ent. Soc.," 1887, p. 94 (1888); Adkin, "Proc. Sth. Lond. Ent. Soc.," 1890-1, p. 126 (1892); Pickett, "Ent. Rec.," xv., p. 271 (1903); Joy, "Ent.," xxxvi., p. 30 (1903); Courv., "Mitt. Schw. Ent. Gesell.," xi., p. 19, pl. ii., fig. 2b (1903). *Striata*, Wheel., "Butts. Switz.," p. 36. *in part* (1903).—The elongation of the submedian row of spots (sometimes also the basal) into long oval, pyriform or cuneate streaks on both fore- and hindwings.

This aberration appears to have been first figured by Mosley, in whose specimen the spots of the submedian row of both fore- and hindwings, as well as the basal spots, are extended into streaks without touching one another. It was captured at Fleetwood, August, 1874, and was sold with the Robson coll. Neave describes a ♂ taken on Brighton Downs, in 1885, in which the usual spots of the underside are replaced

by a series of long dashes. Smith exhibited, at the meeting of the Sth. Lond. Ent. Soc., held December 22nd, 1887, a fine irradiated aberration of the underside. Adkin exhibited a specimen at the meeting of the Sth. Lond. Ent. Soc., held July 9th, 1891, with the submedian spots of the forewings elongated into black streaks, and partially so on the hindwings. Pickett also records a ♀ in which the spots on the underside are elongated, captured at Folkestone, September 5th, 1903, whilst Joy exhibited, at the meeting of the Ent. Soc. of London, held November 19th, 1902, another ♀ with the ocellations developed into black stripes. There are many others in our best British collections. The various *extensa* forms correspond with Courvoisier's sect. *b* of his "*Formæ elongatæ*" which he notes as having the ocellated spots of the submedian row elongated, commoner on the fore than on the hindwings though sometimes on all the wings.

ψ. ab. *radiata*, n. ab. *Icarus* ab., Warburg, "*Ent. Rec.*," p. 329 (1891). *Icarus* ab., sect. *a* Courv., "*Mitt. Schw. Ent. Gesell.*," xi., p. 22 (1903); Gillm., "*Ent. Zeits. Gub.*," xviii., p. 1 (1904). *Striata*, Gillm., "*Int. Ent. Zeits. Gub.*," ii., p. 154 (1908).—The elongation of the submedian to join the discoidal spots, the basal sometimes extended and also united to the discoidal (Courvoisier).

This is the extreme form in the direction of *extensa*, i.e., the extended submedian and basal spots reach the discoidal. There is, however, no union between the submedian spots and chevrons of the marginal lunules, the essential character of the *striata* series. It is included in the sect. *a* of Courvoisier's "*Formæ radiatæ*," and copied verbatim by Gillmer in his paper on Courvoisier's "*Aberrationen der Lycæniden*." Warburg records (*Ent. Rec.*, i., p. 329) the capture, at Cannes, of a specimen with the spots elongated towards the base, the 3rd touching the discoidal.

ω. ab. *striata*, Tutt, "*Brit. Butts.*," p. 175 (1896); Wheeler, "*Butts. Switz.*," p. 36, in part (1903); Clark, "*Ent.*," xxxviii., p. 261 (1905); Lamb., "*Cat. Léop. Belg.*," p. 426 (1907); Gillm., "*Int. Ent. Zeits.*," ii., p. 154 (1908). *Icarus* ab., Read, "*Trans. Ent. Soc. Lond.*," p. 114, pl. xvii., fig. 2 (1853); Newman, "*Brit. Butts.*," p. 128, upper fig. var. (1871); Courv., "*Mitt. Schw. Ent. Gesell.*," xi., p. 22, pl. ii., fig. 6, *a-b* (1903); Gillm., "*Ent. Zeits. Gub.*," xviii., p. 2 (1904); "*Int. Ent. Zeits. Gub.*," ii., p. 178 (1908). *Radiata*, Rebel, "*Berge's Schmett.*," 9th ed., p. 70 (1910).—With the spots on the underside more or less united into streaks (Tutt).

This name was given to the various forms in which the spots were united into streaks. The most striking form that we included under this title was that figured by Newman in his *British Butterflies*, p. 128 (top figure of the two abs. in the "Bond" coll.), and of which we took two exactly similar forms at Upnor, in Kent, in June, 1874, and it is to this form that we would now restrict the name. In this form the submedian spots are united to the black chevrons surrounding the orange spots on the fore- and hindwings, thus making a series of black streaks on all the wings, the basal spots also elongated, and sometimes, in extreme forms, united to the discoidal. It is to this form that we would now restrict *striata*, as the other forms have been since dealt with separately. Read's example, taken near Cambridge, is not figured in all copies of the *Trans. Ent. Soc. Lond.*, for 1853, appearing only in some. It will be observed that our *striata* thus limited is practically identical with Courvoisier's sect. *b* of his "*Formæ radiatæ*," diagnosed as showing "confluence between the curved (submedian) and marginal rows of spots, and eventually

between the discoidal and submedian also, or even between the basal spots and discoidal lunule." [Colthrup notes (*Proc. Sth. Lond. Ent. Soc.*, 1901, p. 24) a specimen taken at Folkestone, by Hills, the spots on the underside being united into longitudinal and radial streaks, but this was in error, the species being later corrected to *Agriades thetis*.]

*aa. ab. sinistro-striata*, n. ab. *Icarus* ab., Russell, "Ent. Rec.," xxii., p. 100 (1910).—The underside striated on the right wings only. Reigate.

This specimen (which we figure) was exhibited at the meeting of the South London Ent. Soc., on February 24th, 1910. We know of no other example nor of a *dextro-striata* form.

*ββ. ab. subtus-radiata*, Obth., "Études," xx., p. 23, pl. iv., fig. 43 and expl. (1896). *Icarus* ab., Newman, "Brit. Butts.," p. 128, bottom figure (1871); South, "Brit. Butts.," pl. cxviii., fig. 3 (1906); Blach., "Bull. Soc. Léop. Genève," i., p. 380, pl. ix., fig. 9 (1909).—The underside with the submedian spots of the forewings united with the marginal chevrons into a series of well-developed streaks, the basal spots also elongated: the hindwings with the first and second submedian spots united with the corresponding chevrons into similar streaks to those of the forewings. From Besançon (Oberthür).

Oberthür's specimen has also an elongated discoidal on the forewings; those figured by Newman (Bond coll.) and Blachier (taken at Hermance, and in the Roch coll.), have a normal discoidal spot to the forewings, but elongated upper basal spot on hindwings. The form is, therefore, intermediate between *ab. striata* and *ab. antico-striata*. There are two very fine specimens of this form in the British Museum coll.—(1) ♂. The forewings with seven black stripes formed by the union of the submedian spots and chevrons of marginal lunules, five of them heavy, the two lowest fainter and greyish; the first submedian spot of the hindwing similarly united to the first marginal chevron; the upper basal spot elongated, the other spotting normal. From the "Mutzell coll.," without data. (2) ♀. Similar, but with six heavy black marks similarly formed on the forewings, the usual sixth and seventh being united into one, the discoidal large, the upper basal very large, the lower basal long but faint; on the right forewing are extra spots on both sides of the discoidal lunule; the hindwing with the first submedian and first marginal chevron united into a streak; the second to sixth submedian spots lengthened towards, but not touching, the marginal chevrons; the three basal spots lengthened. From Zürich (Frey coll.).

*γγ. ab. nigrocuneata*, Lacreuzé, "Bull. Soc. Léop. Genève," i., p. 382, pl. ix., fig. 1 (1909). *Icarus* ab., Lacr., "Ent. Rec.," xx., p. 174 (1908).—The upperside of the wings presents no abnormal characters; it is similar to that of the ordinary ♀. The forewings below are yellowish-white, the two basal spots entirely wanting, the black discoidal spot of ordinary form, but, as it is situated in a whitish zone, the usual white ring surrounding it does not show. The submedian points are very large, cuneiform, and confluent with the antemarginal row of the yellow-orange lunules; in cellule 1b the black spot is geminated and feebly marked. The hindwings below of the same whitish tint as the forewings, but a little paler; the black spots are asymmetrical, in that the right wing possesses three, and the left wing two, very weakly-developed basal spots. A brownish tint accompanies the nervures and strongly accentuates them. The submedian line of spots is not confluent with the anteterminal lunules throughout its length, five spots being confluent, the two in cells ii and iii being isolated. The series of black points, often very large, that precedes the fringe, is entirely absent; as a result, in their place, one finds between the fringe and orange lunules, a series of seven very regular round spots, of the same whitish colour as the ground colour of the wings. Taken at the foot of the Jura, near Geneva, in August, 1907 (Lacreuzé).

The specimen, as figured, corresponds well with the description—

the forewings with a well-marked black discoidal, the submedian spots thrown back towards the margin as in ab. *discreta*, and united to the black chevrons surmounting the orange submarginal lunules. The streaks, however, are very short compared with those of the corresponding ones in Newman's figures (*Brit. Butts.*, p. 128) or those of Oberthür's (*Etudes*, xx., pl. iv., fig. 43) or Blachier's (*Bull. Lép. Genève*, i., pl. ix., fig. 9) figures, and it differs in one or two other details, otherwise we should have no hesitation in referring it to ab. *subtusradiata*, Obth. These differences are—(1) The obsolescence of the basal spots of the forewings. (2) The partial obsolescence of the basal spots of the hindwings. (3) The approach, without actual union, of the upper submedian spots of the hindwings to the black chevrons of the orange spots of these wings. (4) The obsolescence of the black kernels in the marginal lunules of all the wings.

♂♂. ab. *postico-striata*, n. ab.—The submedian row of spots united with the black chevrons of the marginal lunules, forming a series of black stripes on the underside of the hindwings only; the spotting of the underside of the forewings more or less normal.

This is, apparently, one of the very rarest of all the *striata* forms; at any rate, we have seen but very few specimens.

εε. ab. *antico-striata*, n. ab. *Icarus* ab., Barr., "Lep. Brit. Isl.," i., pl. xi., fig. 2h (1893). *Alexis* ab., Obth., "Etudes," etc., xx., pl. iv., fig. 44 (1896).—The submedian row of spots united with the black chevrons surmounting the marginal lunules, forming a series of black stripes on the underside of the forewings only; the spotting of the hindwings more or less normal.

This form occurs rather more frequently than the former, but is still very rare. Oberthür notes it (*Etudes*, xx., pl. iv., fig. 44 *expl.*) as "subtus maculis extensis," and states that his example came from Chartres, and was originally in the Bellier coll.; this example has also extended basal spots on the forewings. Barrett figures a specimen which has one basal spot extended, and, although not developed into streaks, the basal spots of the hindwings are larger than usual, those of the submedian series small. There is another specimen of this form in the "Dale coll.," now in the Hope Museum, Oxford; its teratological peculiarities have already been noted (*anteà*, p. 122). Prideaux notes (*in litt.*) the capture of yet another example of this form, a ♂, at Atherfield, Isle of Wight, in 1895. Blachier sends a drawing of, and describes (*in litt.*), a remarkable ♀, in which the underside of the forewings has a large geminated discoidal lunule, the seven submedian dots united with the seven submarginal chevrons as thick black streaks, of which the lower (6 + 7) is double; the upper basal spot extended into a long streak and the lower into a double dash; the double streak (formed of the submedian spots 6 and 7 united with the double dash of the lower basal spot) forms on the left wing, a distinct *biarcuata* mark, whilst, on the right wing, they merely approach and form a clear *bisemiarcuata* mark; all the streaks and spots are edged with white, which contributes to their conspicuousness on the brown ground colour. The red lunules are united throughout and form a red band. There is near the costa a supernumerary (8th) spot at the top of the submedian series on both forewings (= *addenda*). Taken near Geneva; in the Périnet coll.

♀♀. ab. *confluens*, n. ab. [? Rebel, "Berge's Schmett.," 9th ed., p. 70 (1910) nom. nud.] *Icarus* ab., Courv., "Mitt. Schw. Ent. Gesell.," xi., p. 21, sect. e,

pl. ii., fig. 4e (1903); Gillm., "Ent. Zeits. Gub.," xviii., p. 2 (1904).—The union of the upper basal to the discoidal spot; usually a rare form of aberration.

This is one of the two only forms in which Courvoisier knew *icarus* to occur, out of the seven different aberrative developments included in his "Formæ confluentes simplices" (*Mitt. Schw. Ent. Gesell.*, xi., pp. 20-21). It is also mentioned by Gillmer (*Ent. Zeits. Gub.*, xviii., p. 2), under his "Formæ multiconfluentes" sect. b, as occurring in one specimen in conjunction with *melanotoxa* (*arcuata*) (forewing), and *basijuncta* (hindwing) characters (= *complicata*, n. ab.). The combination of *melanotoxa* (*arcuata*) on the forewings, with *costajuncta* and *basijuncta* of the hindwings is noted as occurring in this species in sect. d of Courvoisier's "Formæ confluentes multiplices" and is repeated by Gillmer under his "Formæ multiconfluentes," sect. 4 (*Ent. Zeits. Guben*, xviii., p. 2).

ηη. ab. *biarcuata*, Tutt, "Nat. Hist. Brit. Butts.," iv., p. 43 (1910); Fritsch, "Berl. Ent. Zeits.," liv., p. 233 (1910).—The two lower spots of the submedian series united with the lower basal spot (or spots) forming a double arch (Tutt).

This is a rather uncommon form, occurring more frequently in the ♀ than in the ♂. We have an excellent example, a ♂, captured at Freshwater, in August, 1889. Reverdin notes (*in litt.*) a ♀ of this form taken at Salins, July 17th, 1909. Very few others have been recorded.

θθ. ab. *melanotoxa*, Pincitore-Marott, "Giorn. Agr. Past.," p. 248 (1873) (*teste* Gillmer\*); "Giorn. Sc. Nat. Palerm.," xiv., p. 341, pl. iii., figs. 14, 15 (1879); Minà-Pal. and Failla-Ted., "Faun. Lep. Sic.," p. 28 (1889); Verity, "Flor. Riv. dell' Instituto Dom.-Ross i," i., p. 9 descr., p. 5, fig. 14 (1903); "Ent.," xxxviii., p. 58, pl. iv., fig. 14 (1904); "Bull. Ent. Soc. Ital.," xxxvi., p. 67 (1904); p. 138 (1905); Sheph., "Ent.," xxxvii., p. 115 (1904); South, *op. cit.*, p. 115 (1904); Wheeler, *op. cit.*, p. 116 (1904); Fletch., *op. cit.*, p. 143 (1904); Verity, "Bull. Ent. Soc. Ital.," xxxviii., p. 28 (1907). [*Polyphemus*, Esp., "Schmett. Eur.," pl. l. (supp. xxvi.), fig. 2 (1779); Schneid., "Sys. Besch.," p. 250 (1787); Gillm., "Int. Ent. Zeits. Gub.," ii., p. 154 (1908); Rebel, "Berge's Schmett.," 9th ed., p. 70 (1909).] *Arcuata*, Weym., "Jahresb. d. naturwiss. Ver. Elberf.," v., p. 55 (1878); Rühl, "Pal. Gross-Schmett.," i., p. 761 (1893-5); Courv., "Mitt. Schw. Ent. Gesell.," p. 20, pl. ii., fig. 4d (left side) (1903); Leonh., "Ent. Zeits. Gub.," xviii., p. 331 (1904). Fletch., "Ent.," xxxvii., p. 316 (1904); Verity, "Bull. Soc. Ent. Ital.," xxxvi., p. 67 (1904); Gillm., "Ent. Zeits. Gub.," xviii., p. 2 (1904); xix., p. 4 (1905); Grund, "Int. Ent. Zeits. Gub.," ii., p. 79 (1908); Tutt, "Nat. Hist. Brit. Butts.," iii., p. 353 (1909). *Icarus* ab., South, "Ent.," xx., p. 76 (1887); Sabine, "Proc. Sth. Lond. Ent. Soc.," 1887, p. 70 (1888); Fowl, "Ent.," xxii., p. 18 (1889); South, "Proc. Sth. Lond. Ent. Soc.," 1888-9, p. 65 (1890); Warburg, "Ent. Rec.," i., p. 329 (1891); Adkin, "Proc. Sth. Lond. Ent. Soc.," 1890-1, p. 170 (1892); Nussey, *op. cit.*, 1892-3, p. 44 (1894); Lov.-Keays, "Ent. Rec.," v., p. 20 (1894); "Ent.," xxvii., p. 72 (1894); Grosv., "Proc. Sth. Lond. Ent. Soc.," 1907, p. 93 (1908); Schima, "Verh. z.-b. Ges. Wien," lii., p. 587 (1902). *Arcua*, Wheeler, "Ent. Rec.," xiv., p. 58 (1902); "Butts. Switz.," p. 36 (1903); Favre, "Mitt. Schw. Ent. Gesell.," xi., supp. p. 4 (1903); Reuss, "Ent. Rec.," xxi., p. 236 (1909). *Regnieri*, André, "Journ. Nat. Macon," ii., p. 52 (1901); Lamb., "Rev. Mens. Nam.," p. 32 (1905); p. 44 (1906); "Cat. Léop. Belg.," p. 426 (1907).—The insect is called *melanotoxa*, on account of the black bow which stands on the underside of the forewings in the middle of the inner margin. It is like *astrarche*, but generally more fuscous, the spots at the outer margin more fulvous. It is much scarcer in our district than *icarus*, and flies in the months of April, May, and often June (Marott, *Giorn. Sci. Nat. Palerm.*, xiv., p. 241).

\* This reference is given by Gillmer (*Int. Ent. Zeits. Guben*, ii., p. 154), no doubt first hand (G. Wheeler). We have, unfortunately, not been able to see it for ourselves yet, nor to get the original description.



Though Esper's figure of *polyphemus* [Schmett. Eur., pl. 1. (supp. xxvi.), fig. 2] shows an underside of this form, there is no particular mention of this peculiar character in Esper's description (*antèa*, p. 142), which, as will be seen by reference, relates chiefly to the peculiarities of the upperside markings, and their bearing on it as a possible var. of *P. icarus*, or as a distinct species. The name, therefore, should, it seems to us, be now used, as was originally intended, for the upperside form. On the other hand, Schneider, later, specially mentions the character in his description of *polyphemus*. As to the name we use, there appears to be considerable difficulty in tracing the original description\*, said to date from 1872, and to have been published in the *Giornale di Agricoltura e Pastorizia*, and we have given Marott's later description of 1879 (*suprà*). Weymer's name *arcuata*, dating from 1879, has been in pretty general use of late years, not, however, without a great many exceptions. South could hardly have been conversant with Marott's description when he erroneously distinguished (*Ent.*, xxxvii., p. 115) *melanotoxa* as having a "bar-like" mark, and *arcua*, an arched one. This aberration appears to be very generally distributed, although usually not common, in both sexes, in most localities in the British Isles, and in those we have worked on the continent. Occasionally a fair percentage of specimens may be captured among the typical and other common forms. We took several ♂s at Deal, Cuxton, etc., in August, 1887. Lovell-Keays notes (*Ent. Rec.*, v., p. 20) the capture of a series of *P. icarus*, the specimens with confluent spots on the underside of the forewings, chiefly ♀s, all taken in a limited area, and apparently in about the proportion of 1:40 of the ordinary form; he adds that similar specimens, in this case confined to the ♀s, were taken near Weymouth when the proportion of such forms was still higher. Fowler records (*Ent.*, xxii., p. 18) that, in 1888, he netted a small colony of this species at Wimborne, consisting of a dozen specimens, the five ♀s all showing more or less confluence in this direction, the ♂s being typical. South exhibited (*Proc. South Lond. Ent. Soc.*, 1888-9, p. 65) a specimen of the *arcuata* form from Bishop Auckland, with an extra basal spot, but lacking one or two of the normal spots of the hindwings. Adkin (*op. cit.*, 1890-1, p. 170) also exhibited examples taken between August 10th-23rd, 1891, at Eastbourne, and Grosvenor (*op. cit.*, 1907, p. 93) others taken on the Surrey downs. Shepherd records the form from the Isle of Man, South, from Ventnor, T. B. Fletcher, from Riddlesdown (June 17th, 1895, and September 12th, 1894). Reuss took (*Ent. Rec.*, xxi., p. 236) a ♀ at Munden, Herts, September 1st, 1904, and Wheeler a ♂, June 8th, 1910, at Bourton-on-the-Water, in the Cotswolds. Verity's statement (*Ent.*, xxxvii., p. 58) that Marott considered it only a ♀ form, appears to have no foundation; it is quite clear that Marott considered it a distinct species, whilst Verity's further statement that "all other writers also considered it a ♀ form up to the time he was writing (1904)," when he took two ♂s and several ♀s in Tuscany, shows a rare want of knowledge of entomological literature. Verity himself found it on the Lucca coast, and says that it is very rare in the Vallombrosa. We have it in both sexes from Susa (August, 1897), Bourg St. Maurice (August 1st-7th, 1898, and August 1st-5th, 1905), Basle (July 23rd, 1904), etc. T. B. Fletcher records (*Ent.*,

\* Reproduced *Nat. Sic.*, no. 1, xviii., p. 3, 1905 (*teste* Leonhardt).



xxxvii., p. 143) ♂s of this form from Malta (May 17th and June 14th, 1902, and July 19th, 1901). Wheeler found it in 1901, at Bouveret, Charpigny, Aigle, etc., the form being common at Charpigny, and near Aigle and St. Triphon, and he expressly states (*Ent. Rec.*, xiv., p. 58, 1902) that it is not confined to the ♀. Blachier notes (*in litt.*) that the form is not uncommon around Geneva, but is more frequent in the ♀ than in the ♂; Reverdin records it from Versoix (July 21st, 1907). It occurs rarely in Belgium, and is recorded from Theux (Mairlot), Verviers (June, 1906) (Boland), etc. Schima records it from Oberweiden, in Austria, Grund from Croatia, Aigner-Abafi from Budapest, Eperjes, etc., in Hungary, where it is rare, though occasionally found. In the British Museum coll. are a ♂ and ♀ from Messina (Zeller), a ♀ from the Cedars of Lebanon, August 26th, 1897 (Elwes), and other examples, which, however, have further developments in the direction of *basijuncta*, *costajuncta*, etc. Buckstone exhibited (*Proc. South Lond. Ent. Soc.*, 1900, p. 103) a very small ♀ of this species, the underside with the forewings of the *melanotoxa* (*arcuata*) form = *ab. minor-melanotoxa*, n. ab. Wheeler took a similar specimen in the Abruzzi last July.

*u. ab. semiarcuata*, Courv., "Mitt. Schw. Ent. Gesell.," xi., p. 20, pl. ii., fig. 4d (right side) (1903); Gillm., "Ent. Zeits. Gub.," xviii., p. 2 (1904); Grund, "Int. Ent. Zeits. Gub.," ii., p. 79 (1908); Gillm., *op. cit.*, p. 154 (1908); Rebel, "Berge's Schmett.," 9th ed., p. 70 (1909). *Polyphemus* ab., Esp., "Schmett. Eur.," i., pl. l. (supp. xxvi.), fig. 2 (1779). *Icarus* ab., Bird, "Ent. Rec.," xviii., p. 280 (1906); Reuss, "Ent. Rec.," xxi., p. 236 (1909). *Subarcuata*, Bell, "Ent. Rec.," xxi., p. 227 (1909).—The origin of the arcuate form of the mark that distinguishes *ab. arcuata*, may be readily recognised in those specimens showing an intermediate stage, *i.e.*, in which the confluence is not complete. These may be known as *semiarcuata* (Courvoisier).

This is, perhaps, a commoner form than *melanotoxa* (*arcuata*), and Courvoisier says that it predominates in the ♀. We have taken it in various British localities, *e.g.*, Deal, Cuxton, etc. Bird mentions a ♂ from Tintern (August 11th, 1906), Reuss a ♂ at Munden, Herts., (September 1st, 1909), Bell, examples at Folkestone (September 11th, 1909), and there are many other records. Often the specimens appear to have the incomplete arch made up of four spots, *viz.*, a double lower basal spot and a duplicated lower spot of the submedian series. As in the last form, this also occurs in both sexes, we have ♂s and ♀s from Abriès (August, 1900), ♀s from Susa (August, 1897), and Bourg d'Oisans (August, 1896), etc. Blachier notes it (*in litt.*) as not uncommon in the Geneva district, and Reverdin remarks (*in litt.*) its capture at Versoix, July 25th, 1907. In the British Museum coll. there is a ♂ of this form from Antioch, a ♀ from Madeira, another ♀ from Athens, May 11th, 1900, whilst another ♀ from Preston, England, is of the blue form on the upperside. We have occasionally noticed specimens with the *arcuata* character well-defined on one side, and *semiarcuata* on the other. We have a very small example, captured at Courmayeur at the end of July, 1894, of the *semiarcuata* form = *minor-semiarcuata*, n. ab.

*κκ. ab. elongata*, n. ab. [?Rebel, "Berge's Schmett.," 9th ed., p. 70 (1910) *nom. nud.*] *Icarus* ab., South, "Ent.," xx., p. 75 (1887); Courv., "Mitt. Schw. Ent. Gesell.," xi., p. 19, sect. a, pl. ii., fig. 2a (1903); Gillm., "Ent. Zeits. Gub.," xviii., p. 1 (1904); "Int. Ent. Zeits. Gub.," i., p. 154 (1908).—The basal spots of the forewings beneath elongated, not duplicated.

Courvoisier mentions this form in sect. *a* of his "Formæ elongatæ," and notes it as occurring in both sexes; the figure to which he refers

shows only the lower basal spot lengthened. Similarly Gillmer in dealing with Courvoisier's paper only notes the aberration as one of the "*Formæ elongatæ*." It is not at all uncommon in various localities; South notes it from Ventnor, etc., and Reverdin observes (*in litt.*) that, in Swiss specimens, especially the ♀, the posterior basal point is often elongated in the form of a javelin. In the British Museum coll. are ♀s from Bulgaria, Broussa, and Rhodes, in which the lower basal spot is elongated in each case; there is also a ♀ from Sarepta that is *elongata* on one side and *tripuncta* on the other, another ♀ from Tangier, *quadripuncta* on one side and *elongata* on the other.

λλ. ab. *tripuncta*, Courv., "Mitt. Schw. Ent. Gesell.," xi., p. 22, pl. ii., fig. 7a (1903); Gillm., "Ent. Zeits. Gub.," xviii., p. 2 (1904); "Int. Ent. Zeits. Gub.," ii., p. 178 (1908); Rebel, "Berge's Schmett.," 9th ed., p. 70 (1909). *Icarus* ab., Nolek., "Lep. Fn. Estl.," p. 56 (1868); South, "Ent.," xx., p. 75 (1887); Kroul., "Rev. Russ. Ent.," iii., p. 111 (1903). *Tripunctata*, Fritsch, "Berl. Ent. Zeits.," liv., p. 234 (1910).—With three basal spots on the underside of the forewings (Courvoisier).

Gillmer notes this as being common in Germany in both sexes. It certainly is so in the British Isles; South notes it from Ventnor, etc. In the British Museum coll. are ♂s from Bagovitza, the Rilo Dagħ Naples, etc. Kroulikowsky records it from Ourjoun, in the Viatka Government.

μμ. ab. *quadripuncta*, Courv., "Mitt. Schw. Ent. Gesell.," xi., p. 22, pl. ii., fig. 7b (1903); Gillm., "Ent. Zeits. Gub.," xviii., p. 2 (1904); "Int. Ent. Zeits. Gub.," ii., p. 178 (1908); Rebel, "Berge's Schmett.," 9th ed., p. 70 (1909). *Icarus* ab., South, "Ent.," xx., p. 75 (1887); Bird, "Ent. Rec.," xviii., p. 280 (1906). *Tetrapunctata*, Fritsch, "Berl. Ent. Zeits.," liv., p. 234 (1910).—With four basal spots on the underside of the forewings (Courvoisier).

This is a not uncommon form of aberration in this country—*e.g.*, Tintern (Bird), Ventnor (South), Cuxton, Folkestone (Tutt), etc. Gillmer also notes it as common in Germany in both sexes.

νν. ab. *quinq̄puncta*, Courv., "Mitt. Schw. Ent. Gesell.," xi., p. 22 (1903); Gillm., "Ent. Zeits. Guben.," xviii., p. 2 (1904); "Int. Ent. Zeits. Guben.," ii., p. 178 (1908); Rebel, "Berge's Schmett.," 9th ed., p. 70 (1909). *Icarus* ab., South, "Ent.," xx., p. 75 (1887).—With five basal spots on the underside of forewings due to the lower basal spot giving rise to three spots (Courvoisier).

Courvoisier only notes this in a single ♀; whilst South records a similar example from Ventnor.

ξξ. ab. *multipuncta*, n. ab. [?Rebel, "Berge's Schmett.," 9th ed., p. 70 (1909).]—Evidently meant to include those examples with more than five basal spots to the underside of the hindwings. Rebel merely gives the name without description, and as if Courvoisier had used it for this species, which is not the case.

οο. ab. *costajuncta*, Tutt, "Ent. Rec.," xxii., p. 51 (1910). *Icarus* ab., South, "Ent.," xx., p. 76 (1887); Adkin, "Proc. Sth. Lond. Ent. Soc.," 1892-3, p. 24 (1894); Fletch., "Ent.," xxxvii., pp. 143, 316 (1904).—The 1st submedian and 1st basal spot of the hindwings united to form a short line parallel to the costa.

Our type is a ♂ in first class condition captured at Deal, in August, 1887. South records it from Ventnor, 1887; Adkin a ♂ taken in the Scilly Isles, June, 1891, and T. B. Fletcher a ♀ taken at Riddlesdown, September 12th, 1894. Reverdin notes (*in litt.*) a ♂ taken at Roelbeau, near Geneva, in May, 1884. In the British Museum coll. is a specimen (already alluded to *antea*, p. 135) from the Zeller coll. taken at Messina, combining *arcuata*, *costajuncta* (one side only), and double *basijuncta*, the penultimate basal and submedian being joined as well as the last, making two distinct bows.

ππ. ab. *basijuncta*, Tutt, "Ent. Rec.," xxii., p. 51 (1910). *Icarus* ab., Bird, "Ent. Rec.," xviii., p. 280 (1906).—The penultimate spot of the submedian series of hindwings united to the penultimate basal spot, thus forming a short line parallel to the inner margin.

One suspects this is a rare form; we have only one example, a ♂, captured at Cuxton, on August 19th, 1887. The two spots in this specimen are considerably approximated so that the streak is unusually short. Bird notes (*Ent. Rec.*, xviii., p. 280) a ♂ in which the left hindwing has the spots between 1b and 1c (Meyrick's system) united, i.e., it is of the form *basijuncta* on one side only. Gillmer describes (*Int. Ent. Zeits. Gub.*, ii., p. 154) specimens from Beske's coll. made at Hamburg between 1826 and 1829, combining (1) *arcuata* with *basijuncta*, and (2) both these forms with confluence between basal and discoidal spots of the forewing. In the British Museum coll. is a specimen from Catania (Zeller coll.) combining *arcuata* and *basijuncta*.

ρρ. ab. *argenteoguttata*, n. ab. *Alexis* ab., Webb, "Ent. Rec.," i., p. 282 (1891).—With the marginal markings on the hindwings ocellated beneath with bright metallic scales, similar to those of *Plebeius argus*, etc.

One suspects this to be a very rare form. We have overhauled a large number of our captures and failed to find a single specimen.

ss. ab. *subtus-obscurior*, Obth., "Etudes," etc., xx., p. 23, pl. iv., fig. 45 (1896).—♀. The underside very dark, the black spots markedly circled with white. Cancale (Oberthür).

ττ. ab. *brunnea*, Fuchs, "Jahrb. Nass. Ver. Naturk.," liii., p. 31 (1900).—Underside of all the wings reddish-grey to reddish-grey-brown, with the usual markings. Everywhere with the type in South and Central Europe. In the second brood of *P. icarus* in South and Central Europe the underside is browner in many specimens, the ♀ having a more rust-brown tint than the ♂, a form parallel with the summer form of *astrarche*. This colouring is also found in the blue form of the ♀, which may equally well be called *caerulea* from the upper-side or *brunnea* from the underside (Fuchs).

υυ. ab. (? var.) *septentrionalis*, Fuchs, "Jahrb. Nass. Ver. Naturk.," liii., p. 31 (1900).—Underside of all the wings polished grey with a greenish tone, lighter (♂) or darker (♀), the black eye-spots sharply ringed with white. In North Europe from Tromsö and Böö. Characteristic examples also come from Böö and Tromsö, called in Staudinger's price list "var. *e*, Norvegica pol." [presumably meaning "from polar Norway"], but, so far, nameless; their wings appear to be longer and more angulated at the apex, from being narrow, especially at the base; the underside is the most characteristic, the ♂ being generally, but not always, lighter than the ♀; the number of eyespots is reduced, the basal spots of the forewings in particular being absent or rudimentary. The ♀s have blue at the bases of all the wings, and a little at the border of the hindwing by the obsolescent reddish-yellow spots (Fuchs).

Fuchs' suggestion that this form of coloration of the underside of *P. icarus* is racial in Scandinavia hardly fits the facts. Our Scandinavian examples show none of this polished grey with a greenish tone, though the sexual difference is well-marked. Schilde also makes (*Ent. Nach.*, 1884, p. 368) no mention of this greenish tint although he mentions that the ground colour of the underside of the Böö examples shows the sexual difference more strongly, in both sexes, than do German specimens.

#### EUROPEAN FORMS.

It is very dubious whether any of the European forms are distinctly racial, not that the southern *celina* is not developed sufficiently to give it a marked facies, but it occurs merely aberrationally in the spring emergence, and is not wholly characteristic of the summer

emergence, some of the ♂s being practically typical. The Sardinian and Corsican forms are quite typical in the ♂s, the ♀s being of the *celina* form, which occurs also aberrationally in the hot summer all over Europe. Our fine western and northern race, *clara*, probably the largest and most beautiful of all, also occurs aberrationally in most parts of central Europe. The following details of these forms may, however, prove interesting:—

a. var. *celina*, Aust., "Pet. Nouv. Ent.," ii., p. 293 (1879); Obth., "Etudes," vi., p. 50 (1881); Staud., "Iris," v., p. 280 (1892); Rühl, "Pal. Gross-Schmett.," pp. 269, 761 (1893-5); Rbl. and Rghfr., "Ann. Nat. Hofmus.," ix., p. 32 (1894); Staud., "Cat.," 3rd ed., p. 85 (1901); Lamb., "Pap. Belg.," p. 231 (1902); Fletcher, "Ent.," xxxvii., pp. 316-7 (1904); Elwes, "Trans. Ent. Soc. Lond.," p. 379 (1905); Fountne., "Ent.," xxxix., p. 108 (1906); Verity, "Bull. Soc. Ent. It.," xl., p. 115 (1908). *Icarus* var., Zell., "Isis," pp. 150 *et seq.* (1847)). ♀ *Rufina*, Fletcher, "Ent.," xxxvii., p. 317 (1904); Seitz, "Gross-Schmett.," p. 312, pl. 80, *g* (1909). ♀ *Flavocinctata*, Rowl.-Brown, "Ent.," xlii., p. 300 (1909). —20mm.-23mm. Brilliant sky-blue, with a very wide black margin; the fringes white; an interneural, marginal series of very large black dots on the hindwing. The underside with almost the same arrangement of spots as in *P. icarus*, but its ground colour, of a pale brown, is darker than that of the latter species; the fulvous antemarginal lunules equally well marked on all the wings; the base of the hindwings not dusted with blue or green. The body is blackish-blue above, white below; the palpi white, except the terminal joint, which is black; the antennæ black, ringed with white, the club black above, fulvous below. This pretty Lycænid appears to be intermediate between *eros* and *icarus*, and was discovered by me in September last at Sidi-Bel-Abbès in Algeria. Four ♂s (the ♀ is unknown to me) (Austaut).

We have examined a very long series in the British Museum collection, and it appears to us that *celina* is, in some ways, a very characteristic form, occurring in Morocco, Algeria, and Sicily, in the summer broods, but appearing more rarely in the early spring, when the ♂s are much more typical in size, colour and appearance, although these again have quite distinct *meridionalis* facies. In this form (*celina*), the ♂s vary greatly in size, and not only have a tendency to develop interneural spots on the outer margin of the hindwings, but they have an unusually strongly dark marginal band on all the wings, which, when united with the interneural spots, sometimes becomes very conspicuous. The undersides of the ♂s are rather dark grey, the ♀s grey, or (particularly in the summer brood) grey-brown, the spots strongly developed, and the orange well-marked. The ♀s are characterised by the strength of the orange lunules on all the wings on both the under- and upperside, often uniting into a continuous band. The very early (March) ♂s sometimes are, sometimes are not, of this form; the early (March) ♀s are strongly tinged with blue, the May examples are much less so, and both the blue-tinted and purely brown forms are found, whilst the hot summer examples are always of the brown *celina* type. It is remarkable to find ♂s labelled "Lambessa, 12. v. '82 (Elwes)" and "Philippeville, 16. v. '82 (Elwes)" quite typical *P. icarus*. The September ♂s are of both forms; of two labelled "Sebdou, Sept., 1880," one is of the *celina*, and one of almost typical, form. The Corsican ♂s are not referable to *celina*, being much nearer the type, but the ♀s are almost identical with those from Mauretania, although the Corsican ♀ has been named *flavocinctata*, by Rowland-Brown (*Ent.*, xlii., p. 300). A single ♀ from Madeira in the British Museum coll. is of the spring form, *i.e.*, tinged with blue; ♀s labelled "Tangier, iii., '85," have

good orange lunules on the upperside of all the wings, but are scaled with blue to the marginal band; another ♀ labelled "Djinina-Sahara, iii. '02 (Mrs. Nicholl)," is also of the same type. Specimens from "Tsauritz Entsagautz, Atlas Mts., 9000ft., 4. vii. '01 (Meade-Waldo)," are not of the *celina* form. The *celina* ♂s in the British Museum coll., are labelled "Klasta, 13. v. '01," "Imentella, Atlas Mts. 5500ft., 7. vii. '01," "Meduna, 29. v. '01" (also a brown ♀, with bright orange spots, almost exactly of the ab. *medon*, Esp., form on the upperside), "Wad Moorbey, Rehamna, 5. vi. '01," "Amsmiz, 29. vi. '01" (also ♀s, brown, but small, with bright orange lunules), etc. These were collected by Meade-Waldo, and are referred to by Elwes (*Trans. Ent. Soc. Lond.*, 1905, p. 379), who records captures made on May 16th, 1901, at Busharin; July 8th, 1901, at Imentalla; July 13th, 1901, at Sould Jedid; and August 17th, 1901, at Tangier. Miss Fountaine remarks (*Ent.*, xxxix., p. 108) that most of the ♂s taken at Sebdu in August, 1904, and at Milianah, in September, 1904, belonged to this variety, and states that she possesses one ♂ from Milianah with a slight inclination to orange spots on the upperside of the hindwings (see *antè* p. 140). Most of the Sicilian ♂s in the British Museum coll. have a strong tendency to this *celina* form, and are, in many cases, the specimens mentioned by Zeller (*infra*), but a fine series of both sexes from Taormina, taken at the end of March, 1905, by Chapman, are not of this form, but are precisely like the specimens already referred to as occurring in Morocco and Algeria in very early spring, in both sexes, suggesting that the form *celina* occurs only as an aberration in the *vernalis-meridionalis* emergence, the form *celina* being really the usual *aestivalis* representatives of the *meridionalis* race. Fletcher seems to have come to the same conclusion about the specimens in Malta, as he remarks (*Ent.*, xxxvii., p. 316) that the spring (March to May) examples are fairly typical, although the blue is generally of a more brilliant hue than in Northern European examples, and in the ♀s the blue markings are restricted, whilst the ab. *arcuata* is not uncommon; the form *celina*, Aust., he adds, occurs in the vernal brood as an occasional aberration of the ♂, but all the summer (June onwards) examples are referable to this form. Oberthür notes (*Etudes*, vi., p. 50) that examples of *P. icarus* were sent to him from Sidi-bel-Abbès in the spring of 1879, and from Sebdu in September, 1880, that the spring specimens were smaller than the French, the blue tint of the ♂s more violaceous, not transparent, and the black border very narrow; the ground-colour of the underside of an uniform grey and the fulvous portions somewhat faint. The only spring ♀ was analogous with *Agriades thetis* (*adonis*) var. *ceronus*. The summer form differed from the spring by its smaller size, and less opaque violaceous tint, allowing the spotting beneath to be seen through. Comparing the seven specimens sent by Austaut with those from other localities, he remarks that *celina*, at first sight, differs from *P. alexis* of France, but comes so near examples taken in June at Cordova in the wide and warm valley of the Guadalquivir, that it is impossible to find any appreciable difference between the Andalusian type and that of Sebdu; the form taken at Cordova varies somewhat, however, as elsewhere, and, besides the examples identical with summer *celina*, he notes larger specimens similar to others from the Sierra Nevada and Rome, which, in turn,

by way of the Tangier form (end of June, 1880), he says, are closely allied to those from the Pyrénées-Orientales, and consequently to the French forms; *celina*, therefore, can, he concludes, only be looked upon as a local variety of *P. alexis*, constant in the warmer part of Oran and Spain, the local race presenting two forms, one vernal (our *meridionalis-vernalis*), the other æstival, *celina*, the latter more characterised than the former, compared with the French type of *P. alexis*. Zeller gives (*Isis*, 1847, pp. 150 *et seq.*) some very interesting notes on the variation of this species, referring particularly to the Italian races, to which he paid considerable attention. Some of his remarks clearly apply to the form *celina*, Aust., as it occurs in Sicily. He observes that southern *P. icarus* vary more than those of central Europe, and remarks on this variation in the following directions—

MALES.—1.—Size—southern examples being of the size of *Plebeius argus* (*aegon*), and never as large as the more northern spring brood.

2.—Ground colour—all the shades of the central European forms being present, and, in addition, one with much heightened colour and with less red tint, taken at Messina in July.

3.—In the spots at the edge of the upperside of the hindwing, which are almost wanting in the Naples form, but almost invariably present in those from Syracuse (end of April, May, and June), Catania (end of June and beginning of July), sometimes larger than in *Agriades thetis* (*adonis*), and uniting with the black border. Two from Syracuse (June 9th) and Catania (June 27th) have them very large and with reddish scales on their inner edge. All those from Messina have large spots, many of them with a border of orange scales [one only is without, and is of such a purple-blue like the northern specimens that I think a wrong date, July 27th, must have been put on by an oversight].

4.—In the colouring of the nervures of the upperside; the Italian, like the German, examples having the subcostal and median nervures with their branches of a light, rather shining blue, but unlike the latter and Loew's examples from Asia Minor, all the black-spotted ones, and even the Neapolitan unspotted specimens, have the ends of the nervures black for some little distance. [Exceptions are three from the Apennines (September 5th) and one from Trieste (September 12th).] This character is never carried so far on the hindwings, but many German examples have the ends of the nervures black on these latter, this is also the case with the Italian examples, but those from Messina have black showing far along the nervures.

5.—In the black marginal line of the forewing, which in German and Asiatic examples never extends to a dark shading on to the ground colour as in the Sicilian and some of the mainland Italian specimens. [Only one Sicilian example (July 26th) is without, three (May 31st, June 3rd, 11th) have some shading and black ends to the nervures, all the rest have a broad shading and well-developed spots, some more so than in *P. argus* (*argyrognomon*).]

6.—In the ground colour of the underside almost all Italian specimens have a strong tinge of yellow in the hindwings, giving a yellow-brown ground colour instead of brownish-grey, with yellowish-white rings round the spots, especially in the summer brood; in addition, there is very little suffusion at the base, and only in the April brood at Messina and Syracuse is there any bluish-green, in the rest it is yellowish-green, and does not reach the basal spots, in some being merely on the base itself; two from Syracuse, however (April 22nd and 24th) are quite like German ones in ground colour and suffusion.

7.—In the colour of the knob of the antennæ which is red or red-brown beneath, and in the more or less distinct white rings; several examples have 20-21 black rings before the knob, instead of the 18-19 of the rest and of the German ones.

FEMALES.—1.—The red spots on the upperside nearly always larger, brighter, and more sharply defined, more like *Aricia astrarche* (*agestis*).

2.—The ground colour of the upperside with a more yellow tone; only April and May specimens have any blue powdering; in these (and a few others only) the row of red spots on the hindwing is edged with blue.

3.—On the underside the yellow-brown of the ground colour and the red of the marginal spots is increased; no green suffusion occurs at the base except in those



with blue on the upperside. [Two ♀s from Broussa are also without green, one from Denizli, and two from Rhodes (April and May) are almost without.]

4.—The number of black rings in the antennæ is variable as in the ♂.

Excluding Zeller's references to the Asia Minor, Neapolitan, Apennine, and Trieste captures, it will be noted that most of the remaining remarks above apply to the var. *celina*, Aust. Indeed, they point out excellently the characteristics of this *celina* form. As bearing on the difference of the specimens in its different habitats, Zeller further notes that, "at Messina, the species appeared as early as April 4th, the ♂s with strong border on the forewing and black spots on the hindwing; the underside as in the German specimens, the ♀ with blue on the upperside, the red spots of forewings not sharply defined; underside as in German ones. At Syracuse, on the wastes and hills of old Syracuse, where the insect is not common, the ♂ is of a clearer more beautiful blue; black shading from the border line and black ends to nervures on forewing; large black spots touching border of hindwing, only one has the spots nearly showing through the blue; underside much yellow in the ground colour, yellow-green at base, not reaching basal spots, four ♀s in May have blue on the upperside and yellow-green base on underside; on and after June 18th, quite without either. At Catania, mostly on a marshy meadow near the town, where species of clover grow between the reeds; ♂s approaching *adonis* in colour, black markings generally as at Syracuse; the spots on the hindwing divided by black nervures, and in two specimens surmounted by reddish; underside with varying degrees of yellow in the ground colour, bright green only quite at the base, two taken July 2nd, were more normal in colour on upperside, and on underside the suffusion extended to the basal spots; ♀s without blue on upperside or suffusion on underside, and with large, sharply defined, red spots and yellow-brown on the underside. At Messina, not uncommon in July, larva presumably fed on *Spartium junceum*, on which the butterflies rested at night, flying in the day about scabious and other flowers—almost all ♂s near *adonis* in colour, a few intermediates, however, show that they are merely *alexis* altered by food and climate; bordering line of forewing often very broad, always with dark shading within it, nervures black for a long distance, black spots on hindwing sometimes indistinct, sometimes large and clear, always divided by black nervures; underside much like German ♀ *alexis* on the hindwing, but with the forewing always grey (only one ♂, dated July 26th, is so unlike these, and so like the Neapolitan ones that the date is probably wrong); ♀s like those of Catania; size, very varied, many not larger than small *aegeon*. At Naples, *alexis* was common at Camaldoli, sitting at sunset on the branches of *Spartium scoparium* at the edge of the chestnut woods, much larger than Sicilian specimens; ♂s approaching northern ones, but still with yellow in the ground colour of the underside of the hindwing, and in the blue suffusion which is still restricted, but the colour of the upperside is often that of German specimens; border line narrow, only quite the ends of the nervures black; rarely more than one or two spots showing through the blue of the hindwing; ♀s of the colour of the Messina summer brood, but accord in size with their own ♂s. The same is the case with the very small ♀s I found at Foligno on September 5th and Tolentino on September 6th; two ♂s of September 5th are of the

bright blue ground colour with strongly developed border line, the other four can only be distinguished from typical *alexis* by the yellow-brown ground colour of the hindwings. A ♂ from Trieste, September 12th, is typical even on the underside. A ♀ from Cisterna, at the northern end of the Pontine Marshes, only differs from the southern ones in having paler reddish-yellow spots." It will be observed from these notes that ♀s throughout Italy show very little difference from one another, but that the ♂s from Naples, etc., are distinctly not of the *celina* type. As a race, the Sicilian ♂s alone, of these here noted, appear to belong to the Mauretanian form. Verity notes (*Bull. Ent. Soc. Ital.*, xxxix., p. 115) that the species is very variable in the island of Elba, indeed, examples are found there identical with those of Continental Tuscany, mixed with others presenting in the most conspicuous manner the characters of the African (and probably Sicilian) race *celina*, Aust., of small size, well-marked series of marginal black spots on the hindwing, and absolute lack of the suffusion of blue scales on the underside of the hindwings.

β. var. *sardoa*, Wagner, "Ent. Zeits. Stuttgt.," xxiii., p. 17 (1909); Gillm., "Ent. Rec.," xxi., p. 260 (1909).—♂. Upperside somewhat deeper blue, but scarcely differing from other specimens; the underside of all the wings, however, which even in the second brood, and, in such southern localities as Dalmatia and Corfu, remains grey, with greenish suffusion at the base of the hindwing, is here brownish to brown, the marginal lunules light reddish-yellow, eye-spots sharply bordered with white, the greenish dusting at the root of the hindwings entirely wanting. ♀. Upperside without blue dusting, marginal lunules large and strongly marked, fringes brown through their whole extent; the underside of all the wings dark brown, similarly without the greenish scaling at the root of the hindwings, the bordering of the eye-spots, and the usual white markings much clearer chalky white. Sardinia, Laconi, May, four ♂s, two ♀s. Just as many other local forms may be found more or less frequently as aberrations among typical specimens, so also var. *sardoa* appears to be found as a very rare individual aberration elsewhere, as is proved by a ♀ from Gaisberg, near Krenis (Preissecker, June 14th, 1908), which agrees exactly with Sardinian ♀s (Wagner).

It is difficult to know on what this local variety is based except that the undersides of both sexes are browner, as in var. *celina* and in ab. *brunnea*, Fuchs. The ♀s on the upperside are of the form illustrated by Esper's ab. *medon*, well-known as an aberration throughout Europe, and as racial in the south in the summer form *celina*. The same is exactly true of the Corsican race, which also has almost typical ♂s, and ♀s of the *medon* or *celina* form, was recently named by Rowland-Brown [*Ent.*, xlii., p. 300 (1909)] ab. *flavocinctata*, and which he compares with that of Auvergne, noting that "another distinctive form of *Lycænid* in Lozère is the ♀ of *P. icarus*, which reproduces, in miniature, the warm, rich, uniform brown of the lovely and larger unnamed summer race from Ajaccio, which I should like to denominate ab. *flavocinctata*, and though yet, so far as Corsica is concerned, accepted as a form of *P. alexis*, it will, I think, some day be differentiated from the type as a constant variety at the least." If the form *sardoa* stands by its browner underside coloration in both sexes, it would fall before *brunnea*, Fuchs, or are the exaggerated white markings of the underside, noted by Wagner, characteristic of the Sardinian race?

γ. var. (et ab.) *clara*, Tutt, "Brit. Butts.," p. 175 (1896); "Ent. Rec.," ix., p. 80 (1897); "Ent. Rec.," xiv., p. 113 (1902); Lamb., "Cat. Lep. Belg.," p. 425 (1907); Turner, "Ent. Rec.," xix., p. 307 (1907); Gillm., "Int. Ent. Zeits. Gub.," ii., pp. 2, 11 (1908). *Icarus* var., Esp., "Schmett. Eur.," pl.



lxxix., fig. 2 (1782); Schöyen, "Troms. Mus. Arshefter," v., p. 13 (1882); Schilde, "Ent. Nach.," x., pp. 368-9 (1884); South, "Ent.," xx., pp. 74 *et seq.*, pl. ii., fig. 2 (1887); Kane, "Ent.," xxvi., p. 243 *in part* (1893); Sparre-Schneider, "Tromsö Mus. Arshefter," xv., pp. 24-5 (1893), Newnh., "Ent. Rec.," v., p. 12 (1894); Crass, "Ent. Rec.," v., p. 100 (1894); Staud., "Iris," x., p. 323 (1897); Sheldon, "Ent. Rec.," xi., p. 13 (1899); James, "Ent. Rec.," xvi., p. 298 (1904); Turner, "Proc. Sth. Lond. Ent. Soc.," 1907, p. 87 (1908).—♂. Bright blue, approaching *Agriades thetis* (*bellargus*) in colour. ♀. Bright blue, with orange spots (especially on forewings) almost obsolete (Tutt).

This was described as an aberration of both sexes, and occurs as such in many of its localities, but in the extreme west and north of Europe the form becomes more or less racial, and attains perhaps its greatest brilliancy in certain parts of Ireland and Scotland, especially in the islands of the latter country. In the more northern parts of Scandinavia, too, it approaches the Scotch and Irish forms in brilliancy in both sexes. Our own series, when the form was described, was too short to show its racial value, or the extent to which the brilliant blue form could be modified where it occurred abundantly. It apparently occurs also racially in some parts of Lapland. With a greater knowledge, we widened our definition of the form, and described it (*Ent. Rec.*, xiv., p. 113) as "a large bright blue form of the ♂, more approaching that sex of *A. thetis* (*bellargus*); the fringes often distinctly marked with black dashes at ends of nervures, occasionally extending halfway through them. The ♀ also larger and usually well-marked with blue scales. On the underside, the spotting is frequently restricted. The normal form in Western Ireland and in some parts of Scotland, much rarer in England, where it only occurs as an occasional aberration." Almost all authors who have been interested in the variation of the Irish and Scotch examples of this species have called attention to the frequent brilliancy of the blue tint in both sexes and the extent to which the ♀s are sometimes scaled with bright blue, *e.g.*, South (*Ent.*, xx., pp. 74 *et seq.*), Kane (*Ent.*, xxvi., p. 243), etc. Salwey notes brilliant examples from Taynuilt, in Argyllshire, June 3rd, 24th, 1880; James (*Ent. Rec.*, i., p. 206), that the ♀s at Pitlochrie, Perth, were particularly large and brilliant in August, 1890. Newnham records (*Ent. Rec.*, v., p. 12) the capture of ♂s of very bright blue colour at Church Stretton; James (*Ent. Rec.*, xvi., p. 298), the Witherslack ♂s as large, one in particular as brilliant as *A. thetis*, and the ♀s strongly marked; Crass notes the South Shields forms as being of a very brilliant blue, and Turner notes a ♂ of similar form from Effingham. But it is in the Scotch islands that the form is still more marked; McArthur states that, in Lewis, in the Outer Hebrides, the ♂s are of a very rich blue, often with distinct black marginal spots on the uppersurface of the hindwings, whilst Sheldon states (*Ent. Rec.*, xi., p. 13) that, in July, 1898, he found "on the island of Kerrera, off Oban, a race of *P. icarus*, the ♂s of which approached *A. thetis* ab. *adonis* in colour; the ♀s also of an exceedingly bright blue tint, two with the entire uppersides, except the red markings, of the most brilliant blue, whilst, in others, the red markings on the uppersides are brighter than those of any *P. icarus* seen elsewhere. It would also appear to be racial in certain parts of Scandinavia, some of our own Scandinavian examples are very brilliant, and Rowland-Brown says that it was especially so at the Alten Fjord, in July, 1906. Schilde gives (*Ent. Nach.*, x., pp. 368-9) an interesting

account of a long series that he took at Bodö, in June, 1879, stating that it was fairly common locally on the Saltenfjord. He observes that the ♂s are of a more beautiful blue than in Central Germany, the Arctic examples being, on the upperside, scarcely distinguishable from eastern *actis*, the fringes very white, the inner part having lost the usual dark tint; in the ♀s the blue is also very rich and intense. Some ♀s, without red marginal spots, show more blue on the upperside than *aegon* ♂, and are scarcely distinguishable on the upperside from *argus* ♂; even the costa of the forewing is blue, inclining to white, the dark discoidal scarcely perceptible; the ground colour of the underside shows the sexual difference more strongly in both sexes than in German examples. He further notes that ten per cent. of his captures were, on the underside, of the form *icarinus*, three also wanting three or all four basal spots of hindwings, and 28 specimens having these basal spots either partially wanting or very faint. The white wedge, he adds, "is very distinct, so is the discoidal spot, which often has no black centre; part of the submedian row is also often wanting; in the extreme cases there are only slight traces of four spots on the forewing and four very faint spots on hindwing." This tallies almost exactly with the variation noticeable on the undersides of our extreme Irish and Scotch examples. Sparre-Schneider notes (*Tromsö Mus. Arshefter*, xv., pp. 24-5) the Tromsö specimens as being of average size — ♂s 32mm., ♀s 28mm.-30mm., the latter, as is usually the case with Arctic specimens, more or less blue above, one especially fine ♀ captured August 15th, 1892, being wholly blue, with broad black borders, and a row of round black spots along the hindmargin of the hindwings without a trace of red lunules. He adds that Schilde's statement that the northern *icarus* are brighter than German specimens may be true, but that he has a ♂ from Cauterets (Pyrenees) which is of a most beautiful blue, almost reminding one of *hylas*, yet otherwise typical *icarus*. Reference should also be made to Schöyen's account of the Arctic forms of this species (*Tromsö Mus. Arshefter*, v., p. 13).

♂. var. *tutti*, Obth., "Etudes Lep. Comp.," fasc. iv., p. 238 (pubd. August, 1910).—*L. icarus* offers in England a race quite special and distinct from the Continental forms. I have given the name of *tutti* to the English *L. icarus*. . . . In order to appreciate the geographical forms of *L. icarus*, I have a large number of examples, and in my collection are about 150 British examples, coming from Rannoch, North Scotland, Dover, Cheshire, North Devon, co. Kerry, North Kent, Glengariff, co. Cork, Folkestone, New Forest, etc. The chief point of differentiation between the English race *tutti* and the Continental forms, is the appreciably more lengthened and less rounded forewings of the former; further, the underside of the wings of the ♂ is of a deeper grey tint, whilst the upperside is of a rather more transparent blue with a more rosy ground colour; the ♀s of *tutti* are generally blue with a border of interneural orange spots, inferiorly punctuated with black, especially on the hindwings; they are further distinguished by a whitish lightening, especially next the apex of the forewings and above the orange marginal spots. The ♀ *caerulescens* of France has not the same appearance as those of England; the former lacks the pale streaks and the wide brightenings of bluish-white, which are the special characteristics of a great number of English ♀ *icarus*. . . . This form varies as those of other countries by the confluence of certain black spots beneath, which unite and form thick curved elongated streaks chiefly along the costal border of the hindwings and the inner edge of the forewings, as well as by the absence more or less complete, of the ocellated spots. Most ♀ *tutti* are *caerulescens*, but some have the ground colour of the wings brown, always, however, with pale areas near the apex of the forewings; along the terminal margin of the hindwings are some pale, silvery-blue scales, more or less dense, scattered near the base of the wings (Oberthür).

This, of course, does not refer to our var. *clara*, the ♂s of which are the bluest forms we get in Britain, approaching the colour of *A. thetis*, and particularly well-developed and racial on the extreme western and north-western and northern coasts of the British Islands; var. *clara* is without distinct reddish tint, a shade that is generally present in our English form. As Oberthür notes, the blue ♀ forms with pale lightening, appear to be peculiarly British. Most of these forms we had already dealt with (*antèa*, pp. 130-131) some time before Oberthür had published the name *tutti* as an inclusive racial name, in fact, several of the forms were named in our *British Butterflies*, 1895. Racially, and compared with our very long Continental series, the British specimens, especially the ♀s, are, as a rule, very distinct.

#### ASIATIC FORMS.

The description, from insufficient material, of various individual specimens of *P. icarus*, as separate species, has led to much misunderstanding and difficulty in dealing with the described forms, yet the species itself is as characteristic in Asia as in Europe, and, on the whole, retains peculiarly the European facies. Throughout Asia Minor, Syria, and Palestine, according to elevation and habitat, the species may be either of quite typical European form, except for a certain brightness of the underside ground colour (var. *turanica*, Rühl), or small and poorly pigmented, as is often found to be the case in the summer brood in Europe (= var. *lucia*, Culot=*labienus*, Jermyn), but both with well-developed spotting and marginal lunules beneath. Occasionally, in Syria and Persia, specimens are captured with the ground colour of the underside almost white, the spots small, the marginal lunules ill-developed, the orange being particularly weak and faintly coloured. This form becomes racial in Beloochistan and Afghanistan, and was described long since by Butler, as *fugitiva* in the spring, and *persica* in the summer or autumn brood, the true *persica*, Bienert, being a mere aberration of the Persian form with the basal and submedian spots on all the wings absent, and the marginal spots much weakened (see *antèa*, p. 157). In the valleys of the mountain-mass of the Hindoo-Koosh, where Northern Afghanistan, Bokhara, Cashmere, Fergbana (*napaea*, Gr.-Gr.), the Pamir (*icadius*, Gr.-Gr.), and Chinese Turkestan (*yarkundensis*, Moore) meet, the species loses the lilac-blue tint that it retains in the south-western corner of Asia and Siberia, and becomes bright *hylas*-blue in colour, retaining, however, a more lilac- or purple-blue hue at high elevations, whilst the underside spotting is small, and the underside ground colour light, the forms differing very slightly in detail. This *hylas*-blue colour of the ♂ is maintained where the species drops down into Thibet and the west boundary of China (*thibetana*). From North Persia, through Bokhara, along the northern valleys of the Altai to Amurland (where the species appears to be rare), the appearance is much more typical, both in its purplish-blue ground colour and in its underside tint and spotting (= *amurensis*). With regard to this form, we have, in our collection, two ♂s labelled "*amurensis*, from Margellan, Turkestan," but are unable to trace the name, and suspect it originated as a "sale catalogue" name of Staudinger's, by whom, we believe, the specimens were originally sent out. They are rather larger than average British examples, of a bright violet tint, with a fine black outer-marginal line, the fringes grey internally, white externally, the underside pale grey,

with the ocellated spots distinct and very well developed. The examples in the British Museum coll. illustrate this, *e.g.*, ♂s and ♀s from Samarkand (ex Staudinger) are quite typically spotted on the underside; three ♂s and one ♀ from Dshungaria have also almost typical undersides, as also have two ♂s from the "Tchuja Valley, 6000ft., 21. vii. '98 (Elwes)" and one ♂ "Biisk, 7. viii. '98 (Elwes)," except that the undersides are rather pale and incline to the facies of the *icadius-napaea-yarkundensis-fugitiva* group, but the undersides have rather more distinct ocellated spots and better developed marginal lunules, although the usual fulvous spots remain yellowish. It may also be noted that, whilst Grum's examples in the British Museum coll., labelled "*kashgharensis*," from "the Sarafschan district," are of the *hylas*-blue form, two ♂s and two ♀s, labelled "Sary-Ob, Sarafschan, 7000-9000ft., Funke, 1900," are different, the ♂s bright blue, but not *hylas*-blue, suggesting that, at high elevations, as well as in the more northern valleys of the Altai, the *hylas*-tint is lost, and the deeper blue of our northern and central European form retained; the two ♀s are practically without blue on the uppersides, one with orange lunules on all four wings, the other with none; the underside of the ♂s whitish, of the ♀s brownish; the ♂s rather weakly, the ♀s well, spotted. Lederer first noted (*Verh. zool.-bot. Gesell.*, 1853, p. 356) the species from Siberia, in June; Staudinger observes (*Stett. Ent. Ztg.*, 1881, p. 264) that the three specimens obtained by Habershauer in the Ala Tau were in no way different from the usual European ones. Herz noted it (*Iris*, xi., p. 237) as common in Witim and Wilni in June and July, not different from ordinary *icarus*, one ♀ with much blue almost exactly corresponding with *ab. persica*, Bienert; one ♂ of *ab. icarinus* only was taken, at Wilni, July 13th, with light blue-grey underside. Staudinger says (*Rom. Mém.*, vi., p. 162) that Bremer brought back a single, but very large and brilliant, example which Maack found in June on the lower Ussuri; Dorries also sent a very large ♂ from Baranowka, the largest *icarus* in his (Staudinger's) collection; Graeser also found one strikingly large ♂ (32mm.) in July near Pokrofska. This species, therefore, so common in Europe, and in the whole of western and central Asia, is a great rarity in Amurland, and seems to be altogether wanting in Japan and China (except Mongolia and the Thibetan frontier). There is only one example from Mongolia in the British Museum collection; this is labelled "Mongolia, 1899, Leder," and has the upperside of an almost typical lilac-blue like the Altai examples, but the underside is very dark grey; the spotting is well developed (although of the *icarinus* type); the margin with well-defined lunules, surmounted by bright orange, and the usual chevrons as in well-marked European specimens (= *mongolica*). Whilst the Mongolian examples are like those of the Altai, except in the tint of the underside, the Thibetan (Elwes) and Chinese\* (Leech) examples are rather of the Himalayan type. Leech says (*Butts. China*, ii., p. 307) that, "in the colour of the uppersurface, the Chinese ♂s of *P. icarus* agree better with the same sex of *P. hylas* of Europe, and the Indian *P. ariana*.

\* These come, according to the locality labels, from just over the Thibet border in the Szu-Chuan district of China. They bear a considerable resemblance to *P. eroides*, but are declared by Chapman, on genetical characters, to be correctly named *icarus*.

All the ♂s have a series of black spots on the outer margin of the hindwings; the ground colour of the ♀ is rather darker than that of ordinary European specimens of this sex, and of that of *P. ariana*. The undersurface is in both sexes darker than in typical *P. icarus*. . . . The species is not uncommon at high elevations in the neighbourhood of Ta-chien-lu, and I have received it from Wa-ssu-Kou and How-Kow. It does not appear to occur in central China." Elwes says (*Proc. Zool. Soc. Lond.*, 1906, p. 485) that "specimens from Lhasa are larger than the next species (*stoliczkan*), and agree with the form which Leech calls *P. icarus*, from west Thibet, in having black-margined spots on the hindwing above." ["West Thibet" is evidently a *lapsus calami* for "China" (see *suprà*)]. This *thibetana* form, then, is also *hylas*-blue in colour, with marginal spots on hindwing. The following are the described Asiatic forms of this species:—

*a. var. turanica*, Rühl, "Pal. Gross-Schmett.," p. 761 (1895); Tutt, "Brit. Butts.," p. 176 (1896). *Persica*, Krödel, "Allg. Zeits. Ent.," ix., p. 50 (1904); Gillm., "Int. Ent. Zeits. Gub.," iv., p. 3 (1910).—Upperside of ♂ lighter blue than that of *P. icarus*; the upperside of the ♀ entirely without blue scales. Underside very light, almost similar to that of *var. persica*. Tura (Rühl).

Rühl's description really gives no tangible difference from European specimens except his last remark that the underside is very light. The Persian examples (♂) in the British Museum coll. are, as a whole, both on the upper- and undersides, quite similar to European in facies in both sexes, showing a similar range of variation in size, colour, and general appearance, and in the spotting of the underside, except that the underside ground colour tends to be perhaps a trifle paler, but even this is problematical; the form with specially pale colour, ill-developed marginal lunules, small dots, etc., which becomes racial farther east, in Beloochistan and Afghanistan, and has been already described as *fugitiva*, Butl., being of very rare occurrence as an aberration. With few exceptions, also, the ♂s in the extensive Syrian series have well-spotted undersides, the tone of the ground colour agreeing largely with three ♂s labelled "Mts. of North Persia—Shakhuh—Christoph coll., 8. vii. '71; 21. vii. '78; 25. vii. '87," which have brightly marked pale grey undersides, with well-defined ocellated spots and well-marked fulvous lunules, quite of the Asia Minor forms in these details. A ♀ belonging to this lot has all the wings unicolorous fuscous, except for the faintest possible trace of marginal dots on the hindwings; the underside of this example is pale fawn in tint. Four other examples from "N.-W. Persia—Seir, 8m. west of Urumiah. Aug. 16th, 1898 (R. T. Günther)" have quite typical uppersides, the undersides inclining to the *discreta* form, the spots well-developed, the ♂s browner-grey than usual, the fulvous of both sexes bright, and all of the *icarinus* form. It will be seen from this that there is really no very definite Persian "local race" of this species, and the giving of a local name, as did Bienert, to a single extreme aberration (= *ab. persica*), in which the basal and submedian spots were wanting, is to be deprecated, although the name having been given, it must, in order to maintain stability of nomenclature, be retained for just the form for which Bienert intended it. His statement that this occurred with "specimens having sharply defined black marginal spots with the red marginal lunules scarcely indicated," as well

as with others of "the typical form," shows that he fully understood that specimens from different parts of Persia offered no really racial characteristics. Graves notes (*in litt.*) that the species occurs everywhere in Syria from sea-level to 7000 feet; the ♂s with the ground colour of the underside very pale and the reddish-orange spots pronounced. Wheeler writes (*in litt.*) of the Asia Minor examples in the British Museum coll.: "There is not one that might not have come from Britain, though the wholly brown ♀s with orange lunules are more Swiss-looking. The ♂s vary in shade, but not as much as in England. There are five ♂s and five ♀s from Broussa varying much in size, the largest having the least pink underlying the blue; the ♀s are all without a touch of blue. A ♂ and ♀ from Erzeroum, the ♂ of a rather duller blue (but not in good condition), the ♀ with the same shade of blue reaching to the hindmargin on hindwing, but with orange chevrons and black spots and a dark costa; forewings with dark hind margin containing traces of orange; one ♂ and four ♀s from Amasia, the ♂ slightly inclining towards *hylas*-blue; one ♀ slightly powdered with blue at base, one with the blue reaching to the orange spots on hindwing, but not much beyond the discoidal of the forewing, the other two covered with blue as far as the orange spots on both wings, though one has a broader dark border than the other—all with orange lunules and black spots on both wings, except the brown one, which is without black spots on the forewing. The underside of the ♂s is rather light, one having rather small spots, the other ♂s and all the ♀s are well spotted. There is also a ♂ labelled 'Asia Minor, ex Staudinger,' and another from the Zeller collection labelled 'Macri' in no way remarkable. There are no dates which enable one to say whether the size has anything to do with the time of emergence." Miss Fountaine observes (*Ent.*, xxxvii, p. 157) that ♀s almost entirely suffused with blue were common at Amasia and Tokat. [See also Staudinger's paper in *Hor. Soc. Ent. Ross.*, xiv., p. 242.]

β. var. *lucia*, Culot, "Bull. Soc. Léop. Genève," i., p. 68, pl. i., figs. 6-8 (1905), *Lucetta*,\* Cul., "Bull. Soc. Léop. Genève," i. Errata (1909). *Kashgharensis*, Seitz, "Gross-Schmett," i., p. 312 (1909).—Compared with typical *P. icarus*, this form is distinguished by its smaller size; ♂ 22mm.-24mm., ♀ 20mm.-23mm. General appearance more rounded. Beneath the hindwings of a blond pearly-grey in the ♂, strongly yellowish in the ♀, with the fulvous spots more apparent, and often forming, especially in the ♀, an almost uninterrupted band; in both sexes there is no metallic blue scaling at the base of the hindwings. . . . I am inclined to believe this may be a distinct species to which *celina*, Aust., may also belong, as *celina* only differs from *lucia* in having an antemarginal series of black dots on the upperside of the hindwings. About 30 examples of both sexes have been received from Syria (Culot).

So far as one can judge, the figures are almost typical of the *minor*

\* We understand that this has been altered to *lucetta* by Culot, because there is a *Cupido lucia*, Kirby. This is *Celastrina argiolus* var. *lucia*, Kirby (*antea* vol. ii., pp. 411-443). No such rule has ever been suggested in the naming of aberrations, and it is contrary to the custom we have adopted now for more than twenty years. We only recognise that a varietal name should not be an existent specific name in the genus as at present constituted, otherwise we insist on accepting the oldest name as the varietal name, and would use it as often as it appears automatically except with the condition suggested above, but even this limitation is becoming obsolete as the trinomialists use *Polyommatus icarus-icarus* and, therefore, cannot fairly object to *P. icarus-thetis* or *P. icarus-eros*, at least on the score of misunderstanding what the name means, and this surely is the only logical reason on which such an objection can be made.



form occurring freely in many of the warmer parts of Europe in the late summer brood. Both sexes are wanting entirely in the characters that specially distinguish *celina*, viz., the comparatively wide black marginal line and interneural marginal spots in the ♂, and the more intense brown ground colour and orange marginal lunules of the upperside in the ♀. Culot's examples appear much more like the *minor* specimens that occur at Grésy-sur-Aix, etc., than the well-marked *celina* of Mauretania and Sicily. Similar small Syrian forms in the British Museum coll. are labelled ♂, "Afka, Lebanon, 10. viii. '97 (Day)," ♀. "Cedars, Lebanon, 26. viii. '97 (Day)," both very small, the ♀ with weakly marked underside. ♀, "Cedars, Lebanon, v. 1900 (Nicholl)," ♀. "Lebanon, May, 1886 (Pratt)," also small, but with better marked spots on the underside. [Seitz, in his picture book, considers *kashgharensis* to be equivalent to *lucia*, and describes the ♂ as being darker on the upperside than the type, and the ♀ as lightly dusted with blue, the underside of both having very small eye-spots. One would like to know what Seitz really knows about *icarus* at all.]

γ. var. *fugitiva*, Butl., "Proc. Zool. Soc. Lond.," p. 606 (1881); "Ann. Mag. Nat. Hist.," 5th ser., ix., p. 207 (1882); Swinhoe, "Trans. Ent. Soc. Lond.," p. 340 (1885); de Nicév., "Butts. India," iii., p. 74 (1890). *Persica*,\* Butler (*nec* Bienert), "Proc. Zool. Soc. Lond.," p. 407 (1880); "Ann. and Mag. Nat. Hist.," 5th ser., ix., p. 207 (1882); Swinhoe, "Trans. Ent. Soc. Lond.," p. 340 (1885); de Nicév., "Butts. India," iii., p. 74 (1890); Staud., "Cat.," 3rd ed., p. 85 (1901); ? Krodel, "Allg. Zeits. Ent.," ix., p. 50 (1904). ? *Chitralensis*, Swinhoe.—Expanse 1.2 in. Intermediate in character between *persica* and *zephyrus*, but nearer to the latter. Wings of the ♂ bright lilacine-blue, with a black marginal line; fringe, with the basal half grey, the external half white; wings of the ♀ smoky-brown, more or less washed with blue towards the base, a submarginal series of small lunate orange spots, the outer border broadly blackish, fringe as in the ♂. Wings below whitish-brown, greyer and paler in the ♂ than in the ♀; the black spots arranged exactly as in *L. zephyrus*, but all smaller and with less conspicuously white zones; the double series of submarginal spots on the primaries grey, and without connecting orange spots in the ♂, paler in the ♀; submarginal spots on the secondaries less distinctly black, the orange spots paler, and relieved by a pure white border as in *L. zephyrus*; base of the secondaries rather more broadly washed with bluish-green. Expanse of wings 1 in. 1½ lin. Three pairs, the ♀s much worn. Quetta, North Beloochistan, March and April (Butler, *Proc. Zool. Soc. Lond.*, 1881, p. 606). A ♀ taken at Quetta, in May, 1881, is larger than a ♀ previously received, and more highly coloured, but agrees in its markings (Butler, *Ann. Mag. Nat. Hist.*, 5th ser., ix., p. 208). Chaman (May), Gwal (May), Sheerog (June), Quetta (March to May), very common (Swinhoe).

The types of *fugitiva* (2 ♂s and 1 ♀ only are now in the British Museum coll.) are labelled "Quetta, March 28th, 1880;" the ♂s of

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\* ♂ 1 in. 2 lin.; ♀ 1 in. 4 lin. Allied to, but distinct from, *L. icarus*, Rott., the cilia shorter, the hindwing more produced at the apex. ♂, underside both wings chalky-white, all the black spots extremely small, the marginal ocelloid spots scarcely visible, those of the forewing showing no trace of orange, those of the hindwing with small pale orange lunules along their inner margin. ♀, with greyish costal border of the upperside of the forewing, and with the greater part of the wing behind this washed with blue, the hindwing broadly touched with blue in the same manner; the orange submarginal spots well separated on both fore- and hindwing. Underside both wings whitish-brown, with all the black spots smaller. Forewing with two additional spots towards the base, the orange of the submarginal spots very pale and restricted. ♂ and ♀ with very little blue or green at the base of the wings on the underside. Abundant at Kandahar in April, May, and June (Butler, *Proc. Zool. Soc. Lond.*, 1880, p. 407). Very common at Kandahar in October and November; also a very large variety taken at Quetta in August and September, and at Kasian and the Lora valley in June, fairly common (Swinhoe).



typical brightly-coloured *icarus*, of the same form as *persica*, Butl., and quite European in facies, but with rather greyer (less white) undersides and rather better indicated marginal lunules. There are also others from the Watson coll. of later date. The types (5 ♂s and 3 ♀s) of *persica* Butl., labelled "Candahar, October, 1880," are brightly coloured *icarus*, ♂s of rather small size, undersides pale, with ill-developed (almost absent) marginal lunules on both wings, with fair-sized black spots, the rings barely lighter than the ground colour; two of the three ♀s are large, both well-scaled with blue beyond disc, with orange lunules on upperside; the underside pale fawn, the spotting as in the ♂s, but the marginal lunules with pale yellowish chevrons indicated, the pale margins of the spots also more conspicuous. Over the greater part of Afghanistan and Beloochistan this form of *P. icarus* occurs, almost identical with *yarkundensis* (*kashgharensis*) on the underside, both with regard to its pale ground colour, small spots, weak marginal lunules, pale yellowish instead of fulvous arches, on the hindwing, absent on the forewing, etc., but the ♂s differing from the latter in that *yarkundensis* (*kashgharensis*) is especially tinged with bright *hylas*-blue, whilst the *fugitiva* forms are more typical lilac-blue in colour, indeed, on the upperside are in some cases hardly, or not at all, distinguishable from European examples. Similar specimens to these occur aberrationally in Persia and Syria, where, however, the usual form of the valleys and highlands is practically indistinguishable from the European type, except that the underside is of a rather lighter or rather brighter ground-colour, the spotting being also almost typical. The only specimens of a very large number of Persian and Syrian examples in the British Museum coll. belonging aberrationally to this race are "♂, Askhabad," "♂, Tekke," "♂, Syria (Müller); Mus. B. (Zeller coll.), "♂, Afka, Lebanon, vi. 1900 (Nicholl)," of which the three former are "pale blue," the last-named "bright" blue on the upperside. These are placed among the "*icarus* from Syria" in the British Museum coll. They agree in having pale undersides, weak marginal lunules of pale grey colour, scarcely a trace of yellowish-fulvous, small ocellated spots in which the white margin is still distinguishable. The other ♂s of the Syrian and Persian series have well-spotted undersides on a bright, but pale, ground colour, with well-defined ocellated spots and orange lunules. This form, we suspect, is the *turanica* of Rühl. De Nicéville seems to have had a good grip of the *fugitiva* form of *P. icarus*. He writes (*Butts. India*, iii., p. 74): "I possess a ♂ named *L. fugitiva*, Butler, by Moore, taken at Quetta, where it appears to be a common species, and occurs from early spring to midsummer. I also possess others taken in October in the Hanna Valley at 6500ft. elevation. In Swinhoe's collection is a considerable series of ♂s of this species from Quetta and one from Chaman. He records it from 'Chaman, May; Gwal, May; Sheerog, June; Quetta, March to May. Very common.' He records *L. persica*, Butl., from 'Quetta from April to June, and of very large size in August and September, and from Kasian and the Lora Valley in June.' These specimens of *L. fugitiva* appear to differ only from *L. persica*, Butl., in having apparently longer cilia and a more prominent black anteciliary line; the markings in *L. persica* below are perhaps smaller, and the ground colour paler, than in *L. fugitiva*. I think that the dry and bare mountainous regions of Baluchistan and South Afghanistan possess a

distinct specialised form of their own of *L. icarus*, distinguished by a much paler, greyer tint below than the more warmly-tinted typical form in Europe, and by the markings below being much smaller and less distinct. . . . The two forms, *L. fugitiva* and *L. persica*, are extremely closely allied, and, if they are really separable, may be seasonal broods of one species or of one variety of *L. icarus*." De Nicéville seems to have got here as far as we have at the present time. Butler's types of *fugitiva* and *persica* are, as we have noted above, in the British Museum coll., and are certainly the early spring (March) and autumn (October) races of the same form. Swinhoe's examples labelled *fugitiva*, also from Quetta (one ♂, one ♀, September, 1880) and Kandahar (one ♂, one ♀, October, 1880) are autumnal specimens, are rather brighter-coloured, and very little different from the *kashgharensis* from Sarafschan, thus showing how closely allied the two forms are. Under the name *kashgharensis*, in another drawer, are one ♂ and one ♀ from Quetta (September, 1880), and two ♂s and one ♀ from Kandahar (October, 1880), both lots from Swinhoe, exactly of Butler's *persica* form, except that the first-named ♀ is very fuscous (no orange on upperside), whilst the underside of the ♂ from Quetta has rather better marginal lunules than those of the other two.

♂. var. *chitralensis*, Swinhoe, "Lep. Ind.," no. lxxxvi., p. 30, pl. 647, figs. 3-3b (1910).—A local form of *P. icarus*. Male, upperside dark lavender-blue. Forewing with a slender black costal line, both wings with a terminal black line. Cilia white, with a brown basal band. Underside dark grey, spots black, ringed with white, much larger and more prominent than in *P. fugitiva* and *P. yarkundensis*, markings similarly disposed, but there are eight spots in the discal row on the hindwing, the lowest two being twin spots; in some examples, the submarginal orange spots of the hindwing are very prominent. Female, upperside dark brown, with a pinkish-ochreous tint. Forewing, in some examples, without any markings, in others, there are three or four pale orange subterminal spots above the hinder angle. Hindwing with a more or less complete series of subterminal black spots, marked with blue on the outer side, and with orange, capped with dark brown lunules, on the inner side, prominent in some examples, more or less obsolescent in others. Underside darker than in the male, and more pinkish tinged, all the spots, and also the subterminal spots on both wings, large and prominent (Swinhoe).

The ♂s of *fugitiva*, Butl., and *persica*, Butl., also appear to agree somewhat closely with a series (eight ♂s, four ♀s) from Chitral, in the British Museum coll., named *chitralensis*, Swinhoe MS., of which the above description has been published whilst this sheet has been passing through the press. The ♂s are of good size, more lilac-blue and less bright blue than those marked *kashgharensis*, i.e., more of the hue of European *icarus*, and not of the *hylas*-blue of *kashgharensis*; the ♀s are also very large, very dull sooty-fuscous in tint, with scarcely any orange markings on the upperside; the undersides of the ♂s are rather greyer than those labelled *kashgharensis*, and the development of the darkish grey chevrons to the marginal lunules on the underside of all the wings gives them a more mottled appearance; the spotting, inclining to the *discreta* form, is also more marked; the underside of the ♀s rather browner, the spotting rather heavier, and the fulvous stronger than in the ♂s, in which it is weak. One ♀ tends to the *addenda* form. The specimens are labelled "Chitral-Drosh, coll. G. A. Leslie and W. H. Evans (1902)"; "Chitral-Drosh, 6000-10000, 4. vi. '03, A. R. C. Saunders"; "Chitral-Madaglasht, 10000ft. 8. vii. 07 (A. R. C. Saunders)." The small differences that

occur in the Afghanistan and Beloochistan race appear to be only such as may be correlated with differences of season, elevation, etc.; at any rate, Quetta appears to produce *fugitiva* as its spring form, and *persica*, Butl., as its autumn form, whilst the great elevation at which the Chitral examples were taken, would account for the comparatively slight differences in these examples when compared with *persica*, Butl., and *fugitiva*, Butl.

ε. var. *icadius*, Gr.-Grsh., "Rom. Mém.," iv., p. 402 (1890); Rühl, "Pal. Gross.-Schmett.," p. 259 (1893-5); Tutt, "Brit. Butts.," p. 177 (1896); Staud., "Cat.," 3rd ed., p. 85 (1901); Seitz, "Gross-Schmett.," p. 312, pl. lxxx, g (1909).—This is distinguished (1) by the angular form of the wings, due to the 2nd nervure of the hindwings being somewhat longer than the others; (2) by the absence\* of the basal spots on the underside of the hindwings; (3) by the entire absence of orange on the underside of both fore- and hindwings in the ♂, as well as on both upper- and underside in the ♀†; (4) by the more delicate blue ground colour of the ♂s above, and that of the ♀s equally delicate, but tending slightly to violet; the ♀s only differ from the ♂s in their shade of colour, by the presence of marginal black spots on the hindwings and a wider margin to the forewings. I know, however, of an exception,‡ in one dark ♀, covered throughout its width with blue scales, very thick only on the margin of the hindwings. All the spots on the underside are, in *icadius*, smaller than in the type, but this peculiarity is of little importance, being found in all the varieties of this species in the Pamir (Grum-Grshimailo).

Grum-Grshimailo says that, in Ferghana, the second-brood flies in August, at Karamouk, in early July, but these specimens probably may not belong to a second-brood, as well as the example of *icadius* that he took at the commencement of July in the Kounjout mountains. There are, in the British Museum, two ♂s and three ♀s labelled as taken by "Grum-Grshimailo, Eastern Hindu-Kuch," one ♀ "Pamir, July 11th, 1887," and another ♀ (the one specially referred to *suprà*) from the Grum-Grshimailo coll., labelled "Aram Kungai Zaabei." These appear to be labelled as Grum's types of *icadius*, and two have labels in Grum's handwriting. Both sexes are of fairly large size, the ♂s of a delicate, but bright, blue, the ♀s strongly tinged with the same shade to, or almost to, the marginal border, and are more particularly characterised by the absence of orange on the upper-side of all the wings. The underside is pale grey in the ♂s, pale fawn in the ♀s, with a very washed appearance; the spots are rather small, and there is a tendency to obsolescence, four out of the six specimens having no basal spot, and one other only one, on the forewings; the marginal spotting is weak, the lunules reddish rather than orange. It will be seen, therefore, that this form agrees on the underside with the characteristic forms from the south-eastern corner of its range.

\* Of the two ♂s (Grum's) in the British Museum coll., only one is without these spots; the other ♂ has two small ones on one side and three on the other; all the ♀s have from one to four spots.

† Both the ♂s have traces of orange on the underside of the hindwings, all the ♀s also on the hindwings and some on the forewings also. The particular ♀, noted below as an "exception" to the upperside colouring, has them well-developed on the underside of the fore- and hindwings and very visible on the upperside hindwing, whilst another, the Pamir specimen, has also traces on the upperside of the hindwing.

‡ This is in the British Museum coll. It is quite suffused with blue to the outer margin of the hindwing, including the orange lunules and to the outer marginal band of the forewings.

♂. var. *napaea*, Gr.-Grsh., "Hor. Soc. Ent. Ross.," xxv., p. 453 (1891); Rühl, "Pal. Gross-Schmett.," i., p. 311 (1893-5).—♂. Wings above greenish-blue, with broad blackish-fuscous margin and white fringes; hindwings with the costal area and very large submarginal spots blackish-fuscous; beneath, wings greyish, paler towards the outer margin, bluish-green at the base, all the spots disposed as in *Lycaena eros*. ♂ 16.5mm. long. One specimen found in the Boro Choro mountains at the frontier of Ludshan (Grum-Grshimailo).

In the British Museum coll. are two ♂s and three ♀s from Grum-Grshimailo's collection, one ♂ of which is labelled in Grum's handwriting, "Kitschi Karamuk . . . Alai nor," also one ♂ of Grum's is labelled "Ferghana." The ♂s incline strongly to *hylas*-blue. The ♀s placed with them are variable, more violet, with the exception of the one labelled *napaea* by Grum himself, on which the amount of blue scaling is small, and much more of the ♂ tint; the two others are also little suffused, the blue not extending beyond the disc on the forewings; all the ♀s have orange on the hindwing, but very little on the forewing. The underside of the ♂ is whitish, of the ♀s brownish, rather well spotted, and scaled with blue (♂) or bronze (♀) basally on the hindwings; the orange on the underside fairly bright. The ♀, labelled "certainly belongs to *icarus*," by Grum, also carries another label "Osch, Fergana," whilst a second bears a similar label, the third carries one "Suzchandarja, Buchara." Two ♂s and two ♀s from the "Elwes coll.," labelled "Sary Ob, Sarafschan, 7000ft.-9000ft., Funke, 1900," certainly are not *kashgharensis*, in spite of their locality (see p. 190), for the ♂s are bright blue, not, however, *hylas*-blue, two ♀s practically without blue, one with orange lunules on all four wings, the other with none; the underside of the ♂s whitish, of the ♀s, brown; the ♂s rather weakly, the ♀s well, spotted on the undersurface. The specimens rather incline to the Kandahar form on the underside, but might pass for *napaea* on the upperside. It is clear from Grum's types that *napaea* is a form of *P. icarus* and not a form of *P. eros* as Staudinger determines (*Cat.*, 3rd ed., p. 84).

η. var. *yarkundensis*, Moore, "Ann. Mag. Nat. Hist.," 5th ser., i., p. 229 (1878); de Nicév., "Butts. India," iii., pp. 68, 71, 75 (1890). *Kashgharensis*, Moore, "Ann. Mag. Nat. Hist.," 5th ser., i., p. 230 (1878); "Scient. Res. 2nd Yark. Miss. Lep.," p. 5, no. 19, pl. i., fig. 7 ♂ (1879); de Nicév., "Butts. India," iii., pp. 68, 71, 75 (1890); Grum-Grsh., "Rom. Mém.," iv., pp. 75, 399 (1890); "Hor. Soc. Ent. Ross.," xxviii., p. 91 (1894); Staud., "Cat.," 3rd ed., p. 85 (1901) (as syn. of *icarus*, v. Rott.); Gillm., "Int. Ent. Zeits. Gub.," ii., p. 2 (1908). *Yarkandensis*, Moore, "Scient. Res. 2nd Yarkand Miss. Lep.," p. 6, no. 21, pl. i., fig. 8 (1879); Grum-Grsh., "Rom. Mém.," iv., pp. 75, 399 (1890); Rühl, "Pal. Gr.-Schmett.," p. 761 (1895); Staud., "Cat.," 3rd ed., p. 85 (1901) (as syn. of *icarus*, v. Rott.); Gillm., "Int. Ent. Zeits. Gub.," ii., p. 2 (1908); Seitz, "Gross-Schmett.," p. 312 (1909). *Kashgariensis*, Rühl, "Pal. Gr.-Schmett.," pp. 269, 761 (1893-5). *Kaschgariensis*, Tutt, "Brit. Butts.," p. 177 (1896).—*Kashgharensis*.—♂. 1.25 ins. Allied to *P. semiargus*. Upperside pale blue with narrow black exterior marginal line, costal edge white; cilia white, with dark inner border. Underside slightly pearly-grey; base of the wings pale metallic green; forewing with a whitish-bordered black spot in the middle of the cell, and a curved discal series of five spots; a very indistinct spot at end of the cell, and a less distinct marginal series of spots; hindwing with three subbasal and a curved discal series of six small white-circled black spots, an indistinct spot at end of the cell, and a marginal row of spots with slightly ochreous upper dentate line. Hab. Yongibissar, 4320ft., Yarkand (Moore). ♀. *Yarkundensis*. Allied to *P. icarus*. Expanse 1.25ins. Upperside dark blue, anterior and exterior borders dusky brown; forewing with an indistinct streak at end of the cell; hindwing with a marginal row of rather indistinct, ochreous-bordered black spots. Cilia cinereous-white. Underside ochreous-grey; forewing with a white-centred black spot in middle of the cell,

another below it, one at end of cell, and a curved discal series of seven spots; a marginal row of indistinct spots, bordered above by a dentate line with pale ochreous interspaces; the hindwing with three white-circled black subbasal spots and a curved discal series of seven spots; a marginal row of prominent spots bordered above by a dentate line with ochreous interspaces. Hab.: Yarkand, 3923ft. (Moore).

These appear to be the ♂ and ♀ of the Turkestan (Thian-Shan) form of *P. icarus*. Of the ♂, named *kashgharensis* by Moore, de Nicéville states (*Butts. India*, iii., p. 75) that "the type and only known specimen is in the Indian Museum, Calcutta; that it is 1.45ins. in expanse, and appears to be abundantly distinct from all the Indian *Lycaena* species, by reason of the smallness and obscurity of all the markings of the underside compared with its large size, but it is possible that were a long series to be obtained, it would be found that the size and distinctness of the markings below, which, in number, arrangement, and general pattern, are those of *L. icarus*, varied so much as to render it impossible to separate *L. kashgharensis* from *L. persica*, *L. fugitiva*, and the allied species, subspecies or varieties of the parent form." Of *yarkundensis*, the same author observes (*Butts. India*, iii., p. 76) "the type and only known specimen is in the Indian Museum\*, Calcutta, and is 1.45ins. (not 1.25ins.) in expanse, and that its sex appears to be ♀. He considers that its distinctness from *P. icarus* is extremely doubtful, especially if it be admitted that the presence or absence of blue or green metallic irrorations at the base of the hindwings beneath, and the obliteration or obsolescence of the discal white streak on that wing are untrustworthy and unsafe characters for specific distinction. Except in the absence of the streak, the Indian Museum specimen differs in no respect from many European examples of *L. icarus*." Grum-Grshimailo (*Rom. Mém.*, iv., p. 399) says that one cannot read Moore's description of *kashgharensis*, nor see the poor figure of it, without recognising at once that one is dealing with a poor specimen of *icarus*. . . . This species is widely distributed in Kashghar, the ♀s (*yarkundensis*) not distinguishable from the *P. icarus* from Ferghana, whence comes the form that Staudinger has named *turanica*."† He then adds: "The chief peculiarities of *kashgharensis* are:—

- (1) The bluer tint of the upperside of the anterior wings of the ♂.
- (2) The smaller size of all the spots on the underside of all the wings.
- (3) Paler colour of the underside of the wings of the ♂.
- (4) The weak development of the orange-red on the upperside of all the wings in the ♀.
- (5) The presence sometimes of bluish scales on the upperside of both wings of the ♀, covering sometimes the whole of the surface in the forewings and the hindwings to the outer border (*yarkundensis*).

The form of *kashgharensis* most different from the typical *icarus* is that of Kitschi-Karamouk in western Alaï, which perhaps deserves a separate name. Unfortunately I have not the ♀, hence, I hesitate to

\* There is an example in the British Museum coll. labelled "Moore coll., Yarkand." This, we understand, is not the type (which is in the Calcutta Museum) but one that was referred to *yarkundensis* by Moore. The underside appears to agree with that of *kashgharensis*, the upperside is in such bad condition that nothing can be said about it.

† *Turanica* stands as a name of Rühl's (1895), i.e., five years later than this note of Grum-Grshimailo's (1890). If, therefore, any form was known to Grum in 1890 as *turanica*, it must, we suppose, have been merely as a MS. name of one of Staudinger's Sale Catalogues. We have dealt with var. *turanica*, Rühl (*antea* p. 182).

introduce a new name.† The *icarus* of Kashghar are distinguished by—

1. The absence of the fulvous on the underside of both wings; it is only rarely visible as a slight demishade.

2. The underside being entirely white.

This last character is also found in the August generation of *icarus* from Ferghana, which are all as blue as the varieties from Karamouk and the Himalaya (*ariana*, Moore)\*. The ♀s from Yarkand and the ♂s from Karamouk as well as those of the second brood, present, usually, a transition to the var. *icadius*, which is remarkably beautiful and distinct. I found it in the southern slope of the Col Beik in the Konjout mountains. Although Grum thus suggests *ariana*, Moore, as a form of *P. icarus*, he goes on to note the nearness of *ariana* to *icarus* and *hunza*, as if the former were distinct from *icarus*, and then adds that some of the *ariana* sent to him as such, do not belong to *icarus* at all but to *eros*, and this latter is exactly the species to which we referred most of the so-called *ariana* in the British Museum, so that one suspects that *ariana*, Grum, is an ab. of *icarus* (which he, himself, suggests is *kashgharensis*), whilst *ariana*, Moore, is a mixture of *icarus* and *eros*, most of the species doing duty as such being either a form of *P. eros*, or more probably a distinct species allied to *P. eros*. We are fortunate in having, in the British Museum coll., an exceedingly fine series of *P. icarus* collected by Grum-Grshimailo in the Sarafschan district, and we think rightly referred by him to *kashgharensis*. The series consists of eight ♂s and eight ♀s, carrying Grum's name and "Sarafschan 17th-20th, viii. '92," except two which were taken on the "9th" (♀) and "10th" (♂) vi. '92," respectively. The ♀s are particularly fine, and vary from one almost entirely fuscous, with a mere trace of marginal spots and orange lunules on the upperside, to one ♀ of a brilliant blue with deep black marginal spots, surmounted by small bright orange chevrons. The underside of these specimens is very characteristic, the ♂s pale (whitish or pearly) with weak marginal spots, scarcely any pale fulvous, the black ocellated spots small, with very narrow white margins, a tendency to loss of basal spots (abs. *candiope* and *icarinus*), and one with only one of the submedian row of dots on hindwing; the ♀s pale fawn, spotting more strongly defined than in ♂, fulvous rather more definite, but still inclined to pale; basal spots usually present. Grum-Grshimailo notes (*Hor. Soc. Ent. Ross.*, xxviii., p. 91) that Glasunow found this form in 1892 in the Serafschan† Valleys and in the Kisilkum Desert, etc., at Pendshakent, Magian-darja, Artutsch, Iskander-Kul, Jagnob-darja,

† Grum-Grshimailo, in 1891, named this form *napaea* (see p. 188).

\* The specimens of *ariana*, Moore, in the British Museum, are of two forms: (1) a form of what really appears to be *icarus*, (2) another form of *eros*, not *icarus*, facies, and we suspect it to be a species allied to, rather than conspecific with, *P. eros*. The difficulty arising from *ariana*, Moore, "Proc. Zool. Soc. Lond.," p. 504, pl. xxxi., fig. 2, lies in the fact that the original description given by Moore quotes "Kunawar" as the habitat; the type in the British Museum coll. labelled as such in Moore's handwriting also came from "Kunawar," and belongs to the *eros* set. This "type" example disagrees with Moore's figure entirely, the latter being a form of *icarus*. The name must, of course, follow the form to which it may be finally determined the description belongs. This, we believe, will prove to be the *eros* form.

† The name is spelt "Serafschan" by Grum and "Sarafschan" on the labels in the British Museum coll.

etc., from May to August; amongst them is a whole row of very small specimens from Varsaminor (Serafschan).

*θ. var. sutleja*, Moore, "Proc. Zool. Soc. Lond.," p. 246 (1882). \*—Near to *L. boisduvalii* and *L. ariana*. Upperside darker, glossy blue, the marginal band narrower; no dusky streaks ascending the veins; the marginal spots on hindwing less prominent. Underside lilacine ochreous-grey, darkest on hindwing; markings similar to *L. boisduvalii* (i.e., *eroides*, Friv.), except that the spot within the cell is further from the disco-cellular lunule, this spot being situated inward of the end of lower median vein; this discal row of spots are more linearly disposed, the marginal spots having their red inner borders more slenderly black-lined; hindwing with a black centre to the disco-cellular lunule; upper discal spots nearer together, thus giving a wider space between the upper one and basal spot: the red borders to marginal spots are somewhat broader and more slenderly black-streaked. Expanse  $1\frac{4}{10}$  inch. Hab. Kangra district. In coll. British Museum (Moore).

There are two specimens from Moore's collection in the British Museum coll. One marked "type" in his writing is hardly distinguishable from a large specimen of *P. icarus* from southern or central Italy, except that the upperside is somewhat darker and the black spots at the edge of the hindwing rather larger. The other does not greatly resemble this in colour, size, or shape; it is much smaller, the wings narrower, and the tint paler and much greener, it has altogether the appearance of belonging to the *eros* group. This, unfortunately is the only one in the regular collection, the other (type) being amongst rejected specimens. It has lost its body, and, therefore, the examination of the genitalia is impossible. Both specimens came from Kangra. With the type is placed a ♀ labelled "Jhela Drosh. Chitral. Capt. S. W. Harris," with a fine row of orange spots on all four wings above, but quite obviously ♀ *icarus*, and scarcely, if at all, differing from some south Italian specimens. Swinhoe gives (*Lep. Ind.*, no. lxxxvi., p. 26) *sutleja* as a synonym of *ariana*, Moore, no doubt on the faith of Moore's specimen in the general collection (which, however, does not agree with the original description), and possibly not having seen the type in the drawer of rejected specimens. Staudinger (probably unacquainted with the type) gives it (*Cat.*, 3rd ed., p. 84) with a ?, as a synonym of *pseuderos*. De Nicéville (*Butts. Ind.*, iii., p. 73), giving it as a separate species, says that he has a specimen named by Moore which only differs from *stoliczkana* by the browner underside and much more prominent outer margins. The spot in the discal cell in this specimen is not placed as in Moore's description, "but is distinctly exterior to the base of the first median nervure." Bingham gives (*Fn. Brit. Ind.*, ii., p. 341) it as a var. of *stoliczkana*, differing only by the ochraceous edgings to the slender black lunules on the underside of the hindwings. Moore seems to have named specimens as *sutleja* with even less care than *ariana*, but, even so, the comparison with *stoliczkana* suggests that neither of these authors was acquainted with Felder's original illustration of the latter, with its exceedingly characteristic underside, to which *sutleja* bears no resemblance. Swinhoe has described (*Lep. Ind.*, no. lxxxvi., p. 25) *stoliczkana* from Felder's types in the Tring Museum, and very justly remarks that these can never have been seen by those who, like de Nicéville, regard this species as a dwarf form of *ariana*, or, like Bingham, sink *ariana* in *stoliczkana* (Wheeler).

\* No synonymy seems possible, as no one else appears to refer to the type form under this name.



1. var. (? ab.) *sibirica*, Fuchs, "Jahrb. Nass. Ver. Nat.," liii., p. 31 (1900); Seitz, "Gross-Schmett.," p. 312 (1909).—Larger and with broader wings, the ♂ entirely without black border, but with sharp black edging line, the roots of the fringe of the forewing only slightly grey, the underside of one shade, pale, the white ring round the eyespots obsolete, sometimes entirely wanting on the forewing. Two ♂s from Krasnojarsk in Siberia (about 55°N. and 95°E.). The wings are both longer and broader than in German examples, the forewing measuring 18mm. from root to apex as against 16mm.-17mm. of the largest German examples in describer's collection. The very narrow black border line shows up very sharply against the fringe on account of the whiteness of the latter throughout its breadth. The colour of one of the specimens is of a darker violet-blue than the other. The underside of both is pale grey, especially so on the forewing, which in the one case is so nearly white that the usual white circle of the eyespots disappears, while in the other it is only obsolescent, the paler of the two is of the *icarinus* form (Fuchs).

This description of two odd ♂s of different tint and differently-conditioned underside under a wide racial name is much to be deprecated. So far as Fuchs' description of these two ♂s goes, it appears to be applicable only to ♂s of large size, with entirely white fringes, and with no white rings to the usually ocellated spots of the underside. The description disagrees essentially with all the Siberian specimens of this species that we have inspected, *e.g.*, from the northern valleys of the Altai range, extending from Samarkand and Dshungaria to the Baikal district and Upper Amur, all of which agree rather with those sent out by Staudinger as *amurensis*.

EGGLAYING.—Our own observations, made on a ♀ laying at Cuxton, led us to suppose that the terminal leaves of *Lotus corniculatus* were usually chosen, and Hellins observes that the axil of the leaf is the spot generally selected. Bird writes (*in litt.*) that, on June 11th, 1906, he watched a ♀ egglaying; and that, in selecting the plants of *Lotus corniculatus* on which to oviposit, she was not in any way aided by the blossom, but seemed to pass over all the well-grown *Lotus* where the blossom was, and chose plants where the herbage had been cropped quite short by cattle. The egg was laid well in the crown of a young shoot at the base and on the upper surface of a leaflet. One egg taken hatched on June 23rd, an egg-period of twelve days. Later, on June 16th, 1907, the same observer noticed another ♀ at Tintern, on a lawn, lay an egg in the interstices of a budding flower-head of *Trifolium repens*. Chapman observes (*in litt.*) that eggs laid on June 10th, 1907, hatched on June 20th, giving an egg-period of ten days. Wood notes (*in litt.*) that a ♀, in confinement, laid 23 ova between August 2nd-4th, 1905; these were usually deposited singly (but in one case up to six in a group) on the upperside of the leaves of Dutch clover. Newman notes (*Ent.*, iii., p. 15) that eggs he had were laid on *Ononis spinosa*, and Clark records (*Ent. Rec.*, xii., p. 282) that an egg figured [*op. cit.*, pl. xi., fig 6 (not 4 as stated)] was laid on *Ononis* on June 13th, 1899. Prideaux mentions (*in litt.*) that ova laid on June 18th, 1900, hatched on the 29th, giving a period in the egg of eleven days, whilst Rehfvous remarks (*in litt.*) that, he observed two ♀s ovipositing on *Medicago lupulinus*, one on July 3rd, 1909, at Geneva, the other on August 7th, 1907, at Glanon-sur-Saône. The eggs were laid singly, usually on leaves, more rarely on the calyx sepals, so that of twenty eggs deposited, sixteen were laid on leaves and four on the sepals; the eggs, of the form of a flattened sweetmeat box, watery-green directly after being laid, rapidly become white, and the larvæ hatched five or six days after-

wards, *i.e.*, in about half the length of time as observed in England. Wolfe first recorded (*Tutt's British Butterflies*, p. 443) the habit that *P. icarus* occasionally has of laying its eggs upon objects adjacent to the foodplant, as well as on the latter itself, and Harrison remarks (*Ent. Rec.*, xvii., p. 24) on the great variety of plants on which the eggs were found in nature during August, 1904, in Fife; the greater number, he says, are laid upon *Lotus corniculatus* and *Trifolium pratense*, but six were found laid on *Plantago lanceolata*, four or five on *Achillea millefolium*, and one on *Pimpinella saxifraga*, not suggesting, of course, that all these were necessarily foodplants.

OVUM.—The egg of *P. icarus* varies in size, the diameter from 0.48mm. to about 0.54mm., and the height from 0.23mm. to 0.25mm. The sides are not very upright, but rounded so as to make the flat top rather under 0.4mm. across. The flat top does not give the same impression of being a very separate and specially levelled area that the eggs of *Agriades coridon* and *A. thetis* do, which I have expressed by saying they looked as if treated by a steam-roller. Quite why this is, is not very evident, the pillars or knobs at the angles of the mesh-work are wanting on top, but do not begin at the margin quite as in *A. coridon*: perhaps the chief reason is the large size and irregularity of the cells of the network; the egg of *A. thetis*, which I describe as having the cells somewhat irregular, has them, however, quite orderly in comparison, and the cells are 0.04mm. across, whilst, in *P. icarus*, a smaller egg, they are about 0.045mm., but vary much. They are triangular, quadrangular, and pentagonal with very varying shapes. The micropylar area is about 0.75mm. across. There are about six cells in this width, but they are rather irregular in form and position, and the central cells do not form at all a regular rosette. The knobs on the tops of the columns of the white coating are well raised but not large; the cells are, as usual, formed by white ribs hanging in catenary curves from knob to knob, and, though a little more regular on the sides than on the top, present various forms nearly as frequently as the more typical triangles arranged hexagonally (Chapman). Of the ordinary echinoid appearance of most Lycaenid eggs; about .5mm. in diameter; delicate green in colour, covered with small white elevations, which are joined by slender, shiny, white curved ribs. The outline is that of a flattened disc, rounded towards the base, and slightly hollowed in the centre of the upper surface. The curved area of the base of the egg is covered with similar, but smaller and finer, reticulation; the upper surface of the egg slopes very gradually to the micropyle, the reticulation being almost identical with that of the sides; the central micropylar depression, almost smooth in appearance, and composed of much smaller cells, is very conspicuous, and greenish in colour (Tutt, June 6th, 1893). Circular in outline, rather flat, just .5mm. in width, less than half that measurement in height; the shell dull, covered on the sides and just over the edge of the upper surface with raised reticulation, having projecting knobs at the knots; this reticulation becomes finer and less prominent on the upper surface, which has a central depressed spot; this spot is green, while the general ground colour is greenish-white, and the reticulation glistening white (Hellins). The egg is figured by Clark [*Ent. Rec.*, xii., pl. xi., fig. 6 (fig. 4 by error)].

HABITS OF LARVA.—The young larva makes its escape from the egg

by eating a large, round hole in the centre of its upper surface, leaving the rest of the shell untouched, and, for some days, in feeding, eats only into the substance of a leaf of *Lotus*, *Ornithopus*, etc., either from the upper- or the underside, leaving the opposite skin as a small, pale, transparent, whitish spot, or by devouring the flowers which it can eat entirely; its colour matches well with the dull tint of the bluish-green *Lotus* leaf; later, the transparent blotches become much more conspicuous (Hellins and Buckler). Chapman observes (*in litt.*) that, when newly-hatched, the larva eats a small hole in the leaf of the foodplant, thrusting in its head and clearing out the parenchyma, like a Coleophorid larva, just in the same way as do the young larvæ of *Agriades coridon* and other Lycænids. He further adds that they differ, however, from the Coleophorid larva, in that, at this stage, they make a very small hole and reach the extremities of the cavity they dig out by means of the extensile neck, and not as in *Coleophora* by taking in the forward segments of the body. This seems to be true of those species that mine leaves at this stage, and that do not appear to like the cuticle as food, it is not so, however, with the larvæ of such species as *Callophrys rubi* that burrow into flowers and make a hole big enough to admit the thorax. A first stage larva of *Agriades coridon*, *Polyommatus icarus*, or *Strymon pruni* on a slide is apt to display this extensile neck, and, when it does so, has a very distorted appearance. When well-fed in this instar, the larva of *P. icarus* assumes a certain amount of colour and marking, although its tint is still pale ochreous, and the markings are in the form of dark brown mottling, making a sort of band down the middle of the dorsum, two between dorsal ridge and spiracles, and one subspiracular. The larva does not appear to eat its cast skin at the end of the first moult as appears to be the custom with that of *A. coridon*. Some newly-hatched larvæ placed on flowers of *Lotus corniculatus*, presented two methods of feeding according to the sizes of the flowers attacked; on those that are rather buds, they merely bore a hole and introduce the head and part of the thorax, and feed on what can be so reached; on what are almost flowers, they enter by boring a hole and getting quite inside and living on the stamens and other interior parts; the small larvæ do not seem to like fully-opened flowers. The difference of procedure is, no doubt, due to two equally cogent facts; in the bud, there is no room for the larva inside without eating all the material *en route*, and this material is also young and nutritive, in the larger bud, there is room inside, and the outer envelopes, being more mature, is not so succulent and nutritive. Chapman further notes that, after the moult, at the end of the 3rd instar, the larvæ look so small that one suspects another moult must take place, but they feed up rapidly and grow very fast in this stage, and soon take on a more mature appearance. Some spring (hybernating) larvæ fed on *Lotus corniculatus* up to the final instar, were then given flowers of *Ulex europæus*, a diet they seem to prefer greatly to the leaves of *L. corniculatus*. There is, of course, a very great deal of difference in the habits of the summer and over-wintering larvæ of this species, the former sometimes feeding up in about six or eight weeks, the latter feeding slowly until in the 3rd instar, when hibernation takes place, and continues till about the end of February or early March. Chapman observed some kept out of doors all the winter (under glass, but without heat),

on the move on February 17th, 1908. Reference may be made here to the question of the difference in habit of larvæ hatching in June. Sometimes a batch of June larvæ feed up entirely, and produce imagines at end of July, August, or early September, according to the season; other batches will subdivide into two, one section of the larvæ feeding ahead, and producing imagines in August or September, whilst those of another section of the same batch, treated in exactly the same manner, grow much more slowly, and, having reached the 3rd instar, resolutely refuse to make progress, and, in this stage, hibernate, and re-commence to feed again in February and March. Sometimes a batch will subdivide into three sections, one set producing imagines in July and August, another in September, the third only reaching the 3rd instar, and hibernating as larvæ in that stage. The larvæ from the eggs laid in July, August, and September all feed up till they reach the 3rd instar, in October, and then hibernate with the laggards from the eggs laid in June. Prideaux notes (*in litt.*) that ova laid on June 18th, 1900, gave larvæ on June 29th, the larvæ feeding well for a few weeks on pods of *Lotus*, that all then, with one accord, ceased feeding entirely, although offered various other *Leguminosae*, but remained alive, about a quarter grown, and were in this stage in October onwards. Rayward observes (*in litt.*) that the larvæ from a batch of ova laid by a Cornish ♀, at the end of June, 1907, all laid up for hibernation early in August, and could not be tempted to continue feeding, although kept in a warm room. He further states that, in feeding, the larva invariably in its earlier stages, and usually throughout its life, eats the cuticle only of the leaves of its foodplant, leaving the veins and midrib, in this respect resembling the larva of *Aricia astrarche*, and differing from those of *Agriades coridon*, and *A. thetis* (*bellargus*), which, in their early stages, eat round holes completely through the entire substance of the leaves. For hibernation, he says that, in confinement, on cut stems of foodplant, the larvæ take up positions on the underside of the leaves, and do not appear to seek the lowest or most secluded parts of the plant; larvæ kept in the open on a growing plant of *Lotus corniculatus* during the winter of 1906-7, however, were found early in March hibernating low down close to the roots of the plant. Two or three larvæ kept in a glass-topped metal box during the autumn of 1907, left the food and laid up for hibernation in the angle formed by the side and bottom of the box; in nature, a sheltered position near the roots is probably always chosen. The hibernating stage takes place, he adds, in his experience always at the 3rd instar. Hibernation, after the first warm days of early spring, however, appears soon to end, and Hellins notes that, on February 5th, 1876, he had one larva more than half-grown, whilst, in 1881, Buckler found larvæ feeding again, after hibernation, on March 18th. One would suspect that the early one noted by Hellins, like the one that Chapman observes as pupating on March 24th, 1908, was influenced by confinement. At any rate, larvæ are usually still small at the end of March, although the transparent blotches in the leaves of the foodplant are pretty easily seen, and they are not, as a rule, fullfed until May or early June. Hellins observes that, when moulting, the larva of this species does not eat its cast skin. Buckler notes (*Larvæ Brit. Butts.*, i., p. 194) that Jordan had often found the species hibernating as a larva in Devonshire, when

searching for cases of *Coleophora discordella* during the winter. Newman erroneously observes that the species hibernates as egg.

SYMBIOSIS OF LARVÆ OF *POLYOMMATUS ICARUS* WITH ANTS.—In August, 1906, larvæ of *P. icarus* hatched from eggs (♀ captured at Folkestone), and, after growing satisfactorily on *Lotus corniculatus* for three or four weeks, laid up for hybernation about September 21st. They were wintered on a growing plant of *Lotus corniculatus*, and during the second week of March were placed in a warm room on *Trifolium repens*, one larva moulting on March 26th, the honey-gland on the dorsum of the 7th, and the evaginable tubes on the 8th, abdominal segments, both being well-developed. A few days later the two most advanced larvæ were experimented with, and an example of *Lasius flavus* was introduced to one of the larva. The ant appeared somewhat sluggish, but after a few moments walked slowly over the back of the larva and proceeded to clean itself, and particularly its antennæ, very thoroughly, the operation lasting some four or five minutes, the larva during this time remaining perfectly quiescent, the honey-glands and evaginable tubes showing no sign of movement. After carefully cleaning its antennæ, etc., the ant went straight to the honey-gland, and, in the most methodical and business-like manner, began to caress it with the antennæ, evidently well aware of the delectable drink waiting to be yielded for the asking, yet the result for several minutes longer continued disappointing, for, although the gland showed some signs of contraction, followed by distention, there was no indication of the protrusion of the inner membrane, which always precedes the flow in *Agriades coridon* and *A. thetis*. Still the ant persisted in its coaxings and caresses, and at length the evaginable tubes on the 8th abdominal segment showed signs of activity, first one, then the other, and presently both together, being evaginated and withdrawn, the time occupied by the double movement of protrusion and retraction being possibly less than one second. The ant took little notice of the activity of these tubes, but continued its entreaties at the gland, and at last with the desired result, for the greenish inner membrane was slowly protruded, and a bead of viscous-looking fluid was extruded, and was quickly and most eagerly absorbed by the ant. The time occupied by the protrusion of the gland and emission of the fluid, was perhaps three seconds, and about twice that length of time was taken by the ant in drinking the bead of liquid. Four times, in the hour covered by this experiment, did the ant succeed in inducing the larva to yield the fluid, but only after the most persistent and continuous coaxing was success attained, and I do not think the larva yielded voluntarily to the ant's solicitations. The evaginable tubes were most active just before the exclusion of the liquid, and, at the times of their evagination, there was a corresponding pulsation of the lips of the gland; it appeared to me that the action of the tubes was intended to cause the ant to desist from its excitation of the gland, and that, having failed in inducing it to refrain for more than a moment from its labours, the protrusion of the membrane and emission of the fluid were spasmodic and involuntary. The tubes are white, and have, at their apex, a number of filaments or tentacles, but the evagination and retraction were so quickly effected that I was unable to ascertain their number. The second larva subsequently gave a successful demonstration also, and the most interesting feature of the

whole experiment appeared to me to be the patient, persistent manner in which the ant continued its caressings, as if it were perfectly well acquainted with the method to be employed, and absolutely assured of the successful issue of its labours. There was at no time any excited running over the body of the larva by the ant, such as was the case in my experiments with *Agriades coridon* and *A. thetis* (*bellargus*) last year; it remained for nearly an hour on the posterior half of the larva, and, for several minutes after each successful termination to its entreaties, devoted itself to combing and stroking its antennæ, as though well aware that the larva required time to recover from the treatment to which it had been subjected. Rayward adds that he has unfortunately not been able to ascertain if any connection exists between the larva of this species and ants before hybernation, and further notes that while his observations of the larvæ of *P. icarus* have, so far, unfortunately been restricted to those reared in confinement, and that he cannot, therefore, state positively that they are attended by ants under natural conditions, there can, he thinks, be very little doubt that they are, occasionally at least, so attended, as the low-feeding habits of the species must certainly frequently bring them into contact with ants, and the functional development of the gland would appear to show that it is not long allowed to remain unemployed (Rayward). It may be further noted that Rayward commented (*Ent. Rec.*, xix., p. 219) on the large size and brilliancy of some bred examples he exhibited at a meeting of the South London Entomological Society, in spite of the fact that ants were almost constantly in attendance on the larvæ.

**ONTOGENY OF LARVA.**—*First instar*: When newly-hatched not quite 1mm. in length, of dumpy figure, the head very small, the prothorax as wide as, and longer than, any of the others, and having a semicircular plate with its rounded edge in front, down the back a row of transverse pits on the front edge of each segment; the general colour grey, with purplish tinge, the segmental divisions green, the belly yellowish; the usual tubercular dots black, on grey warts, each furnished with a rather long, curved, glistening bristle; the whole skin besides being finely sprinkled with tiny black dots. The head shining black; the prothoracic plate rather darker than the ground colour, the spiracles black. It moults when about  $1\frac{1}{2}$ mm. long. *Second instar*: Entirely pale olive-drab, the usual tubercular dots paler than before, only outlined in black; the bristles increased in number, some being short and pale, others longer and darker. It moults a second time when  $2\frac{1}{2}$ mm. long, and is at this time dull pale green in colour, with a paler double dorsal line, and paler subspiracular line. *Third instar*: The dorsum pale greyish-green, the lines on the dorsal ridges rather paler; the spiracles round, pale brownish, inconspicuous; the skin set with a number of small warts; along the dorsal and subspiracular ridges are rows of long tubercular bristles, and on the sides some shorter ones. *Fourth instar*: When 9mm. long the larva is dull, full green in colour, with the subspiracular ridge yellowish, the belly and legs yellowish-green; the head shining black; the spiracles green, indistinct, the bristles very pale brownish. *Final instar*: When full-grown, 12mm.-13mm. in length, nearly 4mm. wide, the head small, and under the prothorax, which is flattened; the other segments slope from the subspiracular ridge up to the double dorsal ridge, the last three also sloping down to the

anus; the segmental divisions deeply cut; the whole skin finely set with tiny hairs; the colour a dark, full green, the dorsal ridges paler, the subspiracular ridge yellowish, the sunken spiracles pale green, the head shining black (Hellins).

**LARVA.**—**SUMMER (NOT HYBERNATING) LARVA:** *First instar* (newly-hatched): Pale ochreous, almost colourless, hardly 1·3mm. long, with black head, very broad, a fine double dorsal crest of long hairs, and a rather shorter lateral fringe, all pale and colourless, but when well-fed, in this instar, assumes a certain amount of colour and marking. One, 2mm. long, is noted as pale ochreous in colour, with dark brown mottling forming a mediodorsal band, two others between dorsal ridge and spiracles, and one below spiracles. The abdominal armature may be described as consisting of—tubercle i, with seta very long and curved; ii, short, these are rather close together; then two large lenticles, upper largest towards front of segment, lower towards middle of segment, a very short hair to front of segment, and at same level and behind it, a hair-base, with a nearly, or quite, obsolete hair, then spiracle, then three hairs on flange, middle one lower, and twice as long, about 0·17mm., as others. The 7th abdominal segment has tubercle i and two lenticles; the 8th has i and a lenticle above spiracle; the 10th has a small plate without hairs or marginal hairs; abdominal segments 7-10 have, on either side, five large and eight shorter hairs; abdominal segment 7 probably claims the ordinary three of these, but which segments the others precisely belong to is not so easily guessed. The prothoracic plate is diamond-shaped (angles transverse), and has a long hair in front and in the middle of each side, with a shorter one at outer angle, a long one behind, and a very minute one in extreme front, and three minute lenticles. Taking the colouring in a lateral view, though the dark is the added colour, there appear to be a pale subspiracular (flange) band, a pale supra-spiracular line, and another between the two lenticles with a dorsal flange pale line; these lines are quite straight, if they are oblique lines, they have not yet acquired any obliquity. Already the dorsal flanges are rounded, and would not deserve this name but that the space between them is hollowed, the slope is, however, fairly flat. *Second instar* (fullfed and laying up for moult): 2·6mm.-3·0mm. long, 0·8mm. wide. The dorsal ridges low and rounded, the dorsal flat rather wide; the slopes not very steep, still with crest of dorsal hairs (those of tubercles i and ii reinforced by others), and have a lateral fringe, with an intermediate set of shorter hairs (two to a segment) probably representing tubercle iii; the mesothorax still high and overhangs prothorax. Colour still ochreous, the dorsum dark, the ridges pale (dark just under them), then a pale line, and then a dark band (just above tubercle iii), followed by a pale band getting darker till it is rather dark just above pale lateral flange, a little darker immediately below flange; the head and chitin of legs black. There are two brown hooks to each of the pads of the prolegs. The spiracles may best be distinguished from lenticles, which are numerous, by being raised into cones, those on 7th and 8th abdominal segments very markedly. *Third instar* (half-grown): Length 4·5mm., height and width 1·7mm., slightly olive-green, with many black points of hair-bases, a slightly darker dorsal line, and indication that ridges would like to be yellow; there are two pale lines with a darker line



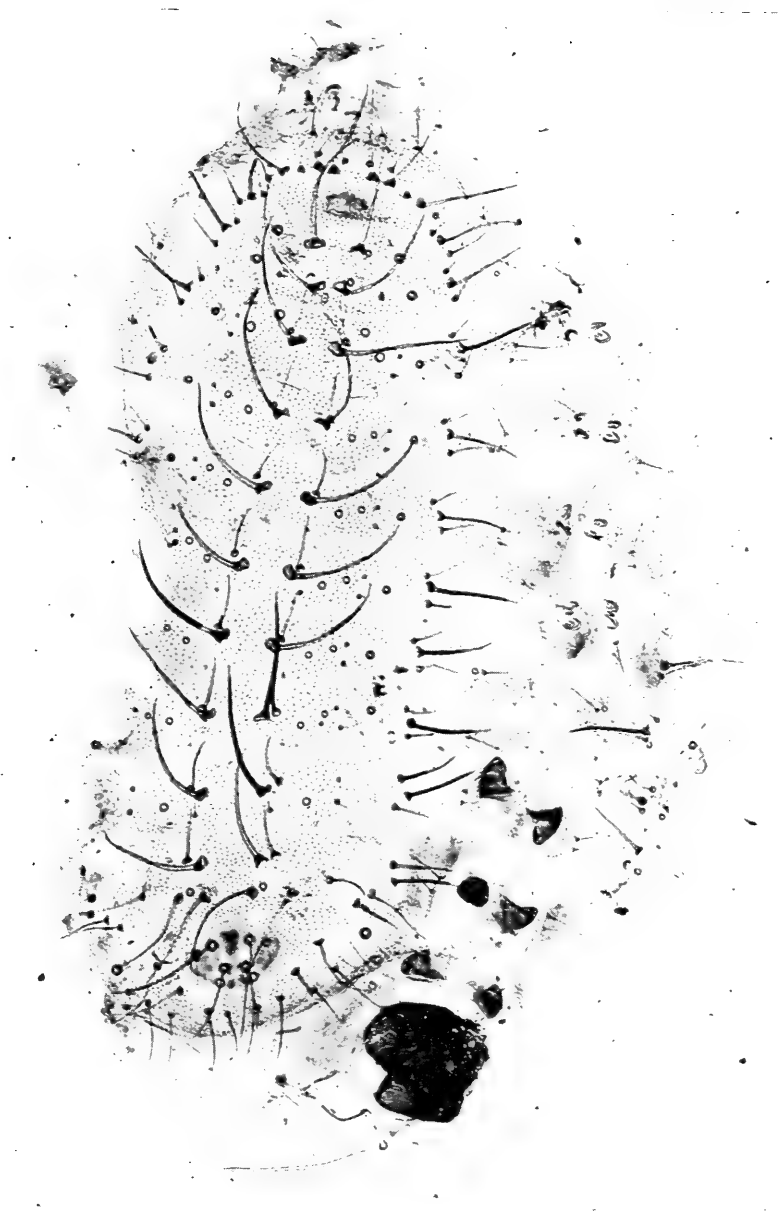


Photo F. N. Clark.

LARVAL SKIN OF *POLYOMMATUS ICARUS* IN FIRST INSTAR  $\times 57$ .

*A Natural History of the British Butterflies, etc., 1910.*

[To face p. 198.]



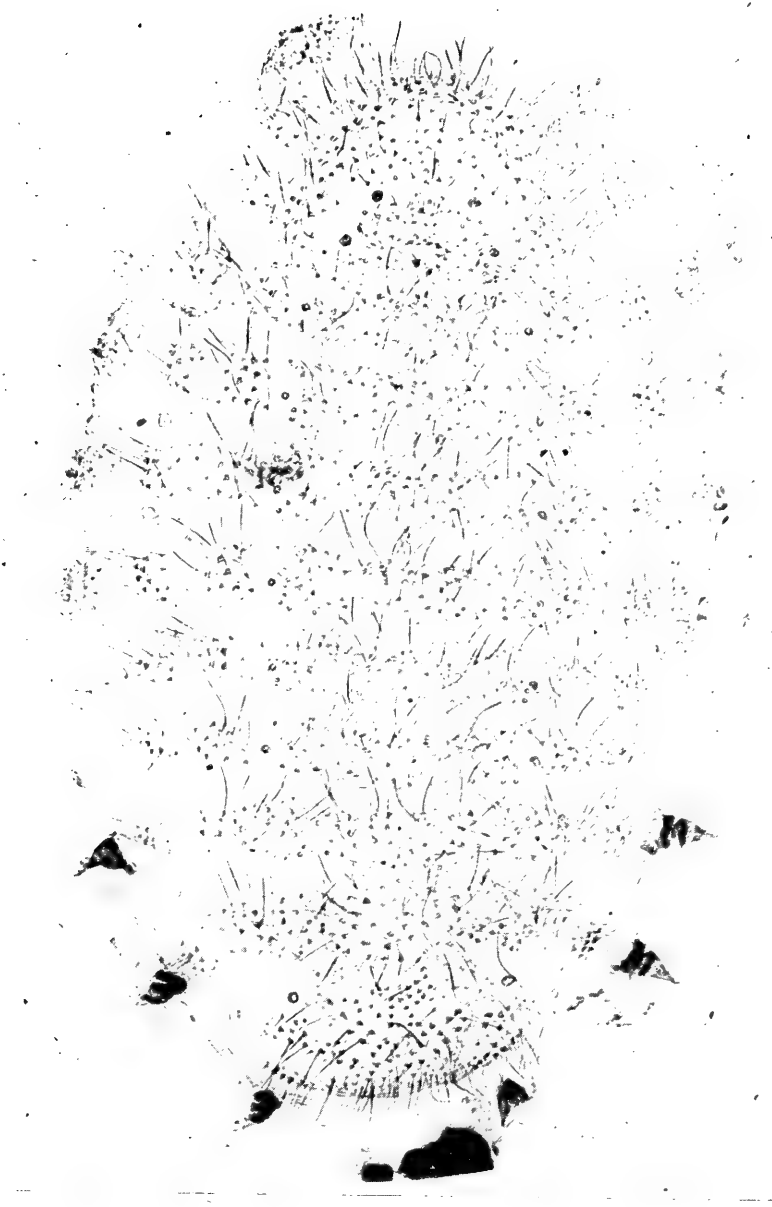


Photo. F. N. Clark.

LARVAL SKIN OF *POLYOMMATUS ICARUS* IN THIRD INSTAR  $\times 16$ .  
*A Natural History of the British Butterflies, etc., 1910.*

[To face p. 198.]







Photo. F. N. Clark.

CAST SKIN OF LARVA OF *POLYOMMATUS ICARUS* AT LAST MOULT  $\times 13$ .

*A Natural History of the British Butterflies, etc., 1910.*

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between them, occupying much of the space between the dorsal ridge and spiracles; still the general effect is of a very unicolorous larva; the dorsal ridges have a shallow dorsal groove, which presents a small pit at front of each segment. The larva is of very uniform width up to close to each end; seen from above, the segments are well separated by a deep incision, and each segment is slightly convex, and three hairs on the flange still show themselves, as more pronounced than the others; seen laterally, the mesothorax forms a hood high over prothorax, the segments behind are not far from a general level, the humping being slight; each dorsal ridge has two very long hairs rather upright, and two shorter deflexed, with many others. The larva is distinctly a hairy one (white spiculate hairs with black bases), laterally, the longest are about 0.5mm., and the longest dorsal about 0.6mm.; they are much shorter on the 7th, 8th, 9th, and 10th abdominal segments dorsally, but, even here, are fairly developed hairs, not short clubs. The slopes have a considerable number of longish hairs (0.06mm. to 0.2mm. long). All the dark hair-bases have a circle of spicules, much the smallest on the longest hairs; round the dark raised spiracles are a good many spiculate lenticles, which are also scattered elsewhere, especially abundant on the dorsum of the 7th abdominal segment behind the honey-gland; on the 7th abdominal segment is the transverse glandular slit, and on the 8th abdominal segment are the post-spiracular eversible glands, with some membrane everted. The pale prothoracic plate is ill-defined, if at all; it carries ordinary hairs, two specially long ones, and some lenticles. Each pad of the prolegs has eight or nine hooks, rather in a group than in lines; central white pad large, each group has especially one very large hook. Head black, smooth. The legs faintly tinted; the general surface has a reticulate or pavement pattern, but, along the front edge of prothorax is a band of recurved spicules; these may have the effect of preventing anything insinuating itself between the head and this invaginated membrane when the head is retracted; there is a tube of membrane connecting head to prothorax about twice the length of the head. Some of the lenticles are spiculated.

*Same instar* (fullgrown): Very fat little larva about 6mm. long; colour dark green with paler lines (or lighter green with dark lines, but as the light green represents yellow markings, the former is best). One specimen has the lateral lines distinctly yellow; on the slope are three oblique pale lines, the lowest, a wider cloud about spiracles; they are but little oblique, and might be called three longitudinal pale lines, but that they are lower at posterior border of segment, and range better with the one below in following segment than with their own; hairs longish. The dorsal ridges are pale, dark between, ridge about  $\frac{1}{3}$  of slope, nearly level as seen from front; crest of brown hairs on ridges; as seen laterally the ridges are rounded, and but slightly acuminate.

*Fourth (and final) instar*: When somewhat grown in this instar, 9mm. long, 3.6mm. broad; colour green with darker dorsal lines, and pale bristles along the dorsum and lateral flange, with fewer on slopes, but a good many very much smaller hairs; spiracles pale, and eversible glands on the 8th abdominal segment conspicuously pale; the dorsal flange with faintest suspicion of yellow; the head black, polished. Another larva is 11mm., both rather thick; both have a yellow lateral line along flange. Between the dorsal ridges is a distinct groove, flange to flange about 0.8mm., length of slope 2mm.; there are, as slightly



paler green shades, two oblique lines, rather less oblique than usual, with a pale shade about the spiracle; both the honey and eversible glands (on the 7th and 8th abdominals) are obvious. The prothoracic plate has a semicircular rounded edge to front, sunk below the raised front of segment and a good deal below mesothorax; it carries numerous short hairs and a dark lenticle or two towards angles. When active the glands of the 8th abdominal segment are somewhat everted and have a hexagonal pattern, and are, at short intervals, suddenly and momentarily jerked inwards (Chapman). **HYBERNATING LARVA** (February 17th, 1908).—[Found a dozen or so of larvæ wandering away from foodplant on which they had been all the winter, under glass, but unheated.] The smallest is 3mm. long, the largest 6mm., except one which is 9mm., and may be in last instar; they are all a dark blue-green with no yellow, but a paler tint on the lateral flange, as though a white or yellow lateral line were desired; the segments are well marked on lateral view, the incisions being deep, the summits rounded. The mesothorax is the first of the series, the 6th abdominal segment the last, the prothorax being flat and at a much lower level, the 7th-9th abdominal segments sloping equally to the posterior extremity. The dorsal groove is very shallow, and hardly exists in a plump specimen; there is a depression or groove down the slope on each segment, not quite straight, it begins below the dorsal flange, and passes down to just behind the spiracle; a separate depression begins at spiracle and ends in a pit just above lateral flange; the hairs are a warm, but pale, fuscous, their bases dark dots, long on the flanges, but rather sparse. *Final instar* (March 22nd, 1908): Of an uniform deep green, almost shining. Most examples show along the flange a narrow pale line from metathorax to end, that looks as if it meant to be yellow, but was really a thread so sunk in the green tissues that it is actually greenish. It has the appearance of being sunk some way beneath the skin. Head black, legs and under surface of paler ochreous tendency, the legs with a few dark lines. The head remarkably small for so large a larva, about 1.2mm. across, and retracted; a larva curved and rigid, under alarm brings the head out slowly, feeling from side to side, but retracts it with a jerk if the alarm recurs; when quite retracted only the paler mouth-parts show, the black cranium being completely hidden. The usual eight segments—two thoracic and six abdominal—have, on side view, quite an angular outline, though the actual angle is rounded off (*i.e.*, does not exist), the front two-thirds of the segment slope upwards and backwards in a straight line, the posterior third similarly upwards and forwards (of course, more steeply), the angle being about  $100^{\circ}$ ; the (subsegmental?) groove down each slope is well-marked, with subsidiary upholstered depressions at spiracle and some way above spiracle ("upholstered," presenting hollows, like those in cushions, seats, and backs of chairs, etc., where the surface is held down by buttons, etc.); the dorsal and lateral hairs are much longer than elsewhere; the larval length (larva a bit sulky) 11mm., height and width 4mm., slopes flat, dorsal groove a distinct hollow; slopes 3mm. high, 1mm. across dorsal flanges. My mounted skins show distinctly that there are two moults before hibernation and two after, so that there are five larval instars, I do not appear to have made descriptions of each of these from living larvæ. My notes might suggest that there are

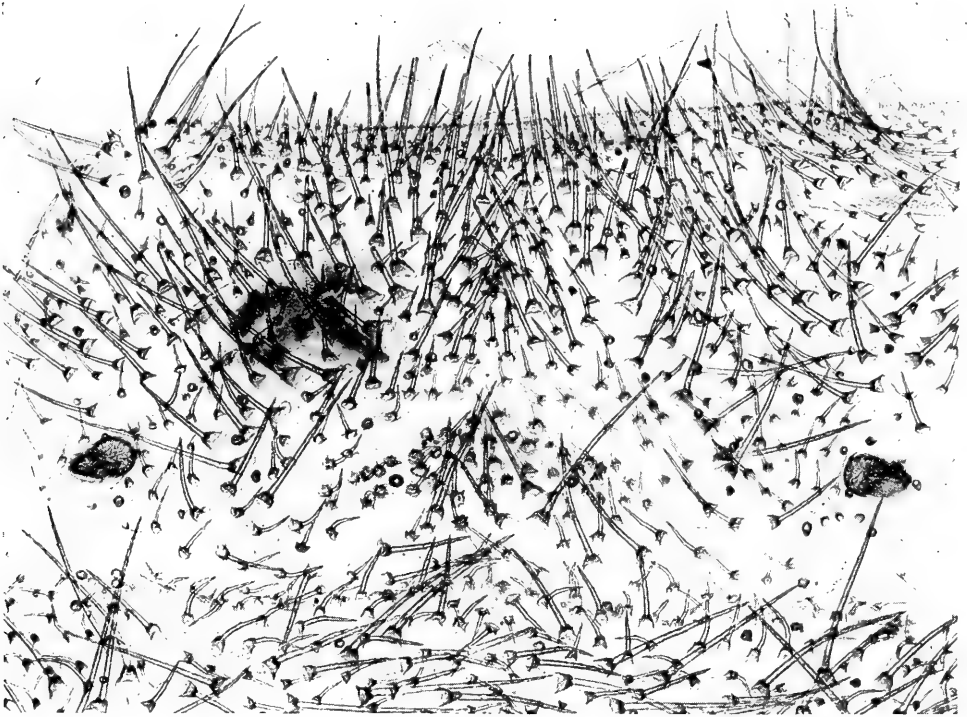


FIG. 1.—DORSUM OF PROTHORAX OF LARVA OF *POLYOMMATUS ICARUS*, LAST INSTAR  $\times 35$ .

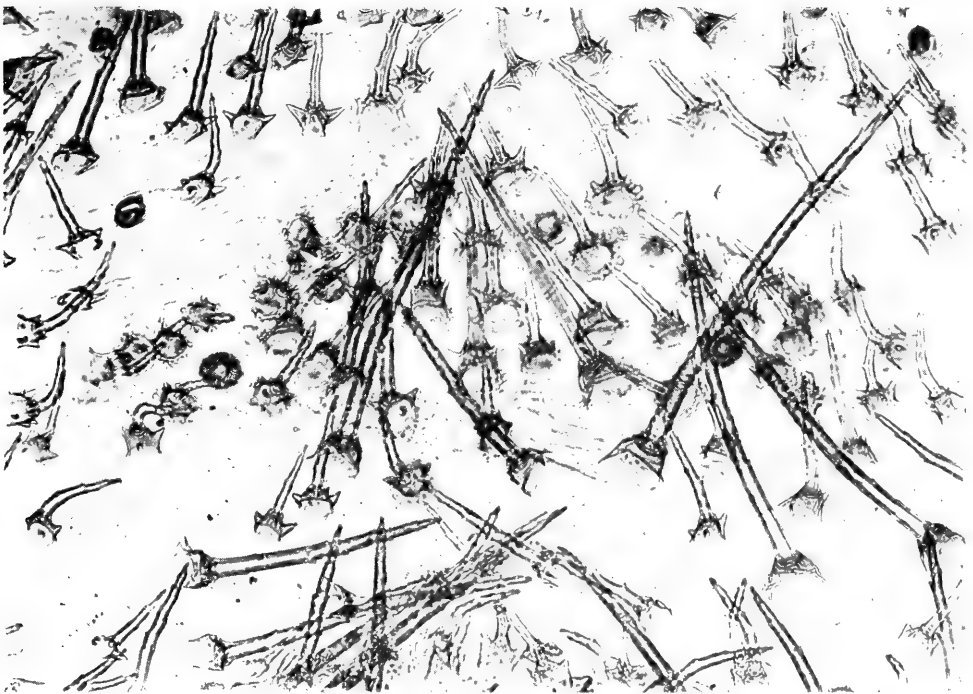


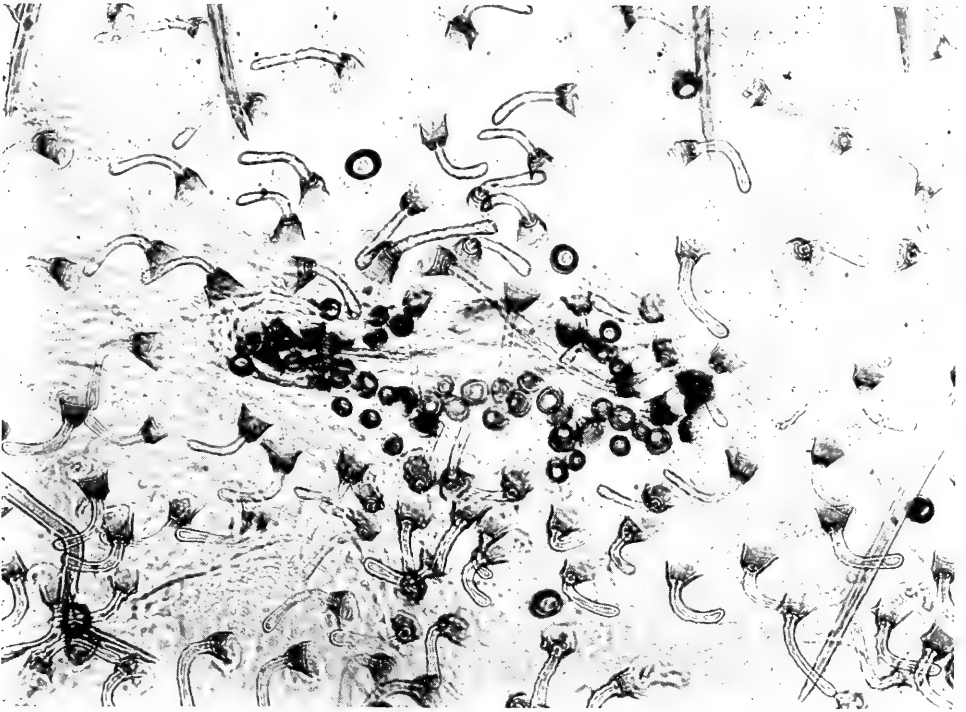
FIG. 2.—PROTHORACIC PLATE OF LARVA OF *POLYOMMATUS ICARUS*, LAST INSTAR  $\times 100$ .  
 2 Photo. F. N. Clark.

DETAILS OF LARVA OF *POLYOMMATUS ICARUS*.

*A Natural History of the British Butterflies, etc., 1910.*

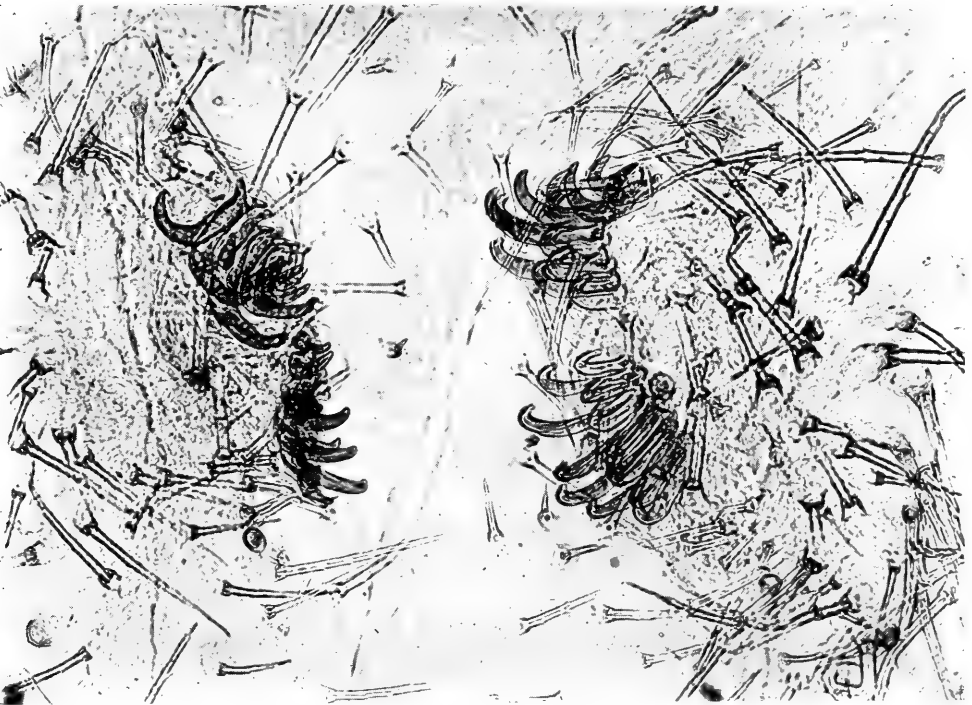
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1

FIG. 1.—LARVA OF *POLYOMMATUS ICARUS*, LAST INSTAR, SHOWING HONEY-GLAND  $\times 100$ .



2

Photo. F. N. Clark.

FIG. 2.—LARVA OF *POLYOMMATUS ICARUS*, LAST INSTAR, 2ND PAIR OF PROLEGS  $\times 100$ .

LARVAL DETAILS OF *POLYOMMATUS ICARUS*, LAST INSTAR.

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only four instars in the summer brood, this is possible, but I think my having omitted to observe properly is more likely (Chapman). *Final instar*: Head very small, glabrous, oblong, porrected in crawling, otherwise withdrawn into the 2nd segment and totally concealed; body convex above, flattened below, rounded at both extremities, dilated and lobed at the sides; the divisions of the segments conspicuously marked; spiracles situated much above the lateral margin, the posterior pair dorsal; whole surface covered with extremely minute warts, each of which emits a hair. Colour of the head intensely black, of the body green, sometimes bright apple-green, at other times dull olive-green; a mediodorsal stripe rather darker; a narrow lateral stripe below the spiracles, but above the lateral lobes much paler, almost white; between the dorsal and lateral stripes there are, on each side of each segment, three pale oblique lines, their inclination being from the anterior to the posterior margin of the segment; the minute warts black; legs, claspers, and ventral surface of the same green hue as the body (Newman, *Ent.*, iii., p. 15).

QUIESCENT STAGE PRECEDING PUPATION.—A larva was laid up for pupation several days before it pupated, on March 24th, 1908. Seen against the light during this period, it has a curious appearance; it seems filled with blue fluid, almost the blue of sulphate of copper, but not very dark, with a denser body floating centrally in it, dorsally and ventrally, the clear fluid seems nearly 1mm. thick, the dense interior about 3.5mm. thick. This may be really fluid, or an exaggeration of the Lycænid larval skin, which often seems to be a very thick gelatinous material. The specimen has pupated this morning, March 24th (Chapman).

FOODPLANTS.—*Onobrychis hedysarum* (Engramelle), *Ononis spinosa*, *Astragalus glycyphyllos* (Ochsenheimer), *Trifolium*, *Melilotus*, *Genista vulgaris* (Neustädt teste Treitschke), *Lotus corniculatus*, *Ononis arvensis* (Hellins), *Ornithopus perpusillus* (Buckler), *Trifolium* (Caradja), *T. pratense* (St. John), *T. repens* (Bird), *Medicago sativa* (Curtis), *M. minima* (Mühlig), *M. falcata* (Favre), flowers of *Ulex europæus* (Chapman), *Spartium* (Rühl), [*Fragaria vesca* (Borkhausen, Ochsenheimer, Viret, Frionnet, etc.), *F. collina* (Assmuss), strawberry leaves (Curtis). In spite of the oft-repeated *Fragaria*, of authors this requires confirmation.] [Grasses (Kirby), is certainly an error; probably assumed from Lewin, *Brit. Ins.*, p. 80; dahlia (Goossens teste Ragonot) also wants confirmation]; wild liquorice (Curtis).

PUPARIUM.—This species, as those of *Agriades*, pupates without forming a definite girth or pad; indeed, the absence of cremastral hooks has long since shown that the pupa could not possibly be supported by its anal extremity. Chapman, however, notes (*in litt.*) that he observed in a mounted pupa of *P. icarus*, close to the cremastral area, a scrap of larval skin, which serves to illustrate how, in this and the allied species without cremastral hooks, the pupa, nevertheless, often remains suspended by attachment to the larval skin, which in turn still adheres to the few threads spun by the larva. Speaking of some larvæ that had pupated on April 3rd, 1909, Chapman says (*in litt.*) that four larvæ "went down" amongst the loose flowers of *Ulex* in the bottom of the tin and spun four or five of these together as a cocoon; two accepted little bits of paper rolled up into a quill-like tube. It is a little difficult to see what there may be to call a girth,

as the cocoon obscures matters, and to break the cocoon disturbs the whole arrangement. In one instance, nothing to represent a girth can be found; in the others, quite apart from the cables forming a cocoon, are certain threads crossing over at the posterior border of the mesothorax, irregular in quantity and varying in their fastenings, but unquestionably representing a girth. One specimen "spun up" on the lid of the box, and had on pupating nothing to support it but the "cocoon," which nevertheless holds it, somewhat tremulously, in place. This cocoon is, to all intents and purposes, a girth. It has rather irregular and diffuse fastenings at each end, but across the larval dorsum there pass, from a place about opposite the wing spines, a couple of threads across the front of the mesothorax, and another across it further back, or really for the most part on the metathorax, and two more over the 1st abdominal; these are all, however, connected directly with the same origin beside the middle of the mesothorax. There is another thread not belonging to this set, and therefore clearly merely "cocoon" across the 3rd abdominal segment. Since there are no cremastral hooks, that is, since the hooks have become obsolete too, we must assume that the girth is not in process of development, but of degeneration, or rather, perhaps, has developed into a cocoon, without having quite forgotten its original form and purpose. After pupation, a removal of the leaves above the pupæ, left them quite free, except that one pupa has a thread of silk, by means of which it can be lifted, attached to the meso-metathoracic incision (Chapman). Hellins notes that his fullfed larvæ did not spin any girdle for pupation, although they went to the cover of their cage for that change, and he adds that, when it took place, the larval skin remained fixed, whilst the pupa had fallen down. Rayward notes (*in litt.*) that, when full-grown, the larva generally draws together three or four leaves of the foodplant by spinning round them a few threads of silk, and in this exceedingly slight cocoon undergoes its transformation to the pupa. Of about a dozen larvæ reared in confinement in the spring of 1907, all but one chose this position for pupation, and the single exception spun a slight pad of silk on the side of the bottle containing the foodplant, and supported its thoracic segments by a girth composed of some three or four silken strands attached at some distance from each other to the glass side of the bottle, but coming close together over the thorax; in this horizontal position, the larva pupated safely, and the imago emerged in due course, leaving the empty pupa-case still attached to the side of the vessel.

PUPA.—The newly-formed pupa has the wings very transparent, and all the tracheæ of the nervures of both wings very distinct; there are fine hairs all over the dorsum; it has no sign of cremastral hooks, the end of the pupa being smooth and rounded. The pupa is pale green, lighter and transparent over the thorax and wings, rather denser and slightly olive over the abdomen; the head and terminal segments slightly flesh-tinted; no marks, except a darker dorsal line (really the dorsal vessel) down the abdomen; the skin is apparently glabrous, but under a microscope shows a good many very fine hairs (dark) 0.06mm. long and less, and a few finely stellate hairs, which are little more than half the length of the ordinary hairs. The general surface has a reticulation of fine raised lines, wider apart than in the Theclids, running more frequently longitudinally and without any





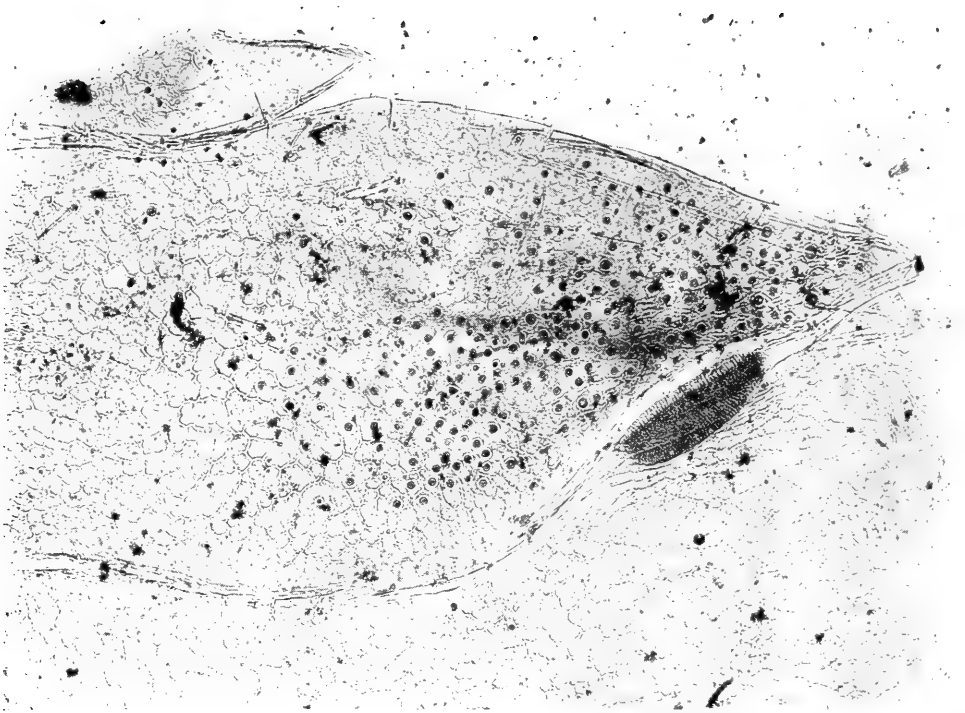


FIG. 1.—PROTHORAX OF PUPA OF <sup>1</sup>POLYOMMATUS ICARUS, RIGHT SIDE  $\times 40$ .

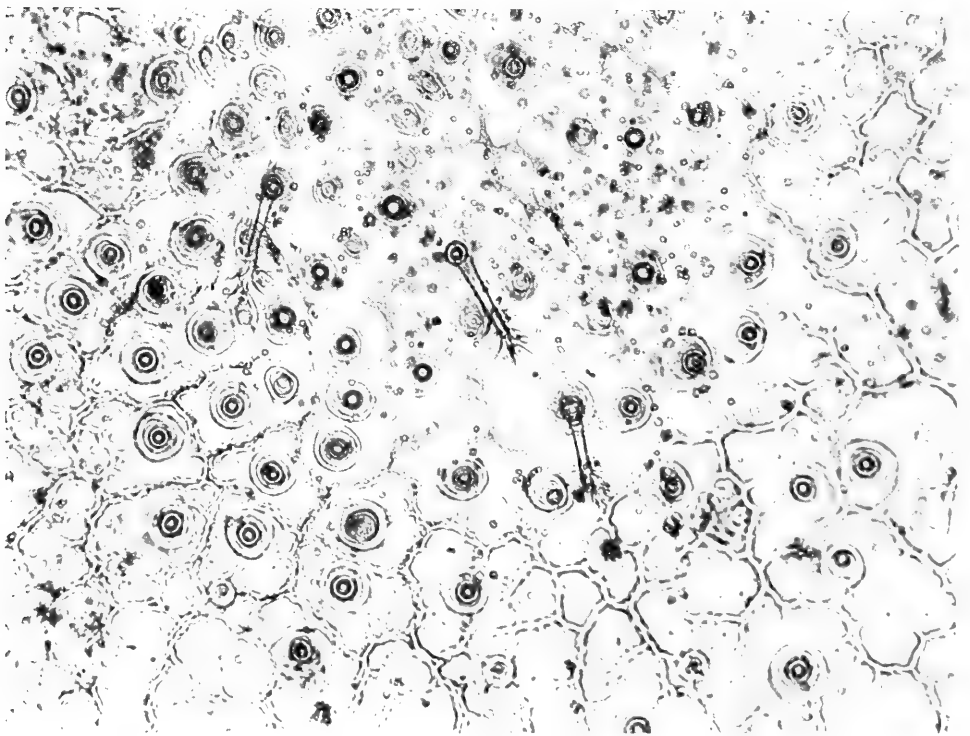


FIG. 2.—SPICULATED HAIRS ON PROTHORAX OF PUPA OF <sup>2</sup>POLYOMMATUS ICARUS  $\times 150$ .  
DETAILS OF PUPA OF POLYOMMATUS ICARUS.

Photo. F. N. Clark.

modulated points (rosettes). The reticulation is complete, *i.e.*, the lines do not end free, but are continuous as on the wings of *Chatten-denia w-album*. There are a good many dark minute lenticles near the spiracles. The narrowness of the head, its forward position (not having the prothorax as a cowl), contrasts markedly with *C. w-album*; the thorax and the abdomen are more nearly of the same width and height than in, for example, *Celastrina argiolus*; the width at the wing-base is 3mm., at the 3rd abdominal, 4mm., so that the difference is, nevertheless, considerable; the mesothorax rises into a median ridge, flattened on each side. The pupa for some days after changing is very delicate and transparent. The thorax green, the head and abdomen olive, the wings rather white when they lose their absolute transparency. The dimensions of the pupa may be tabulated as follows:

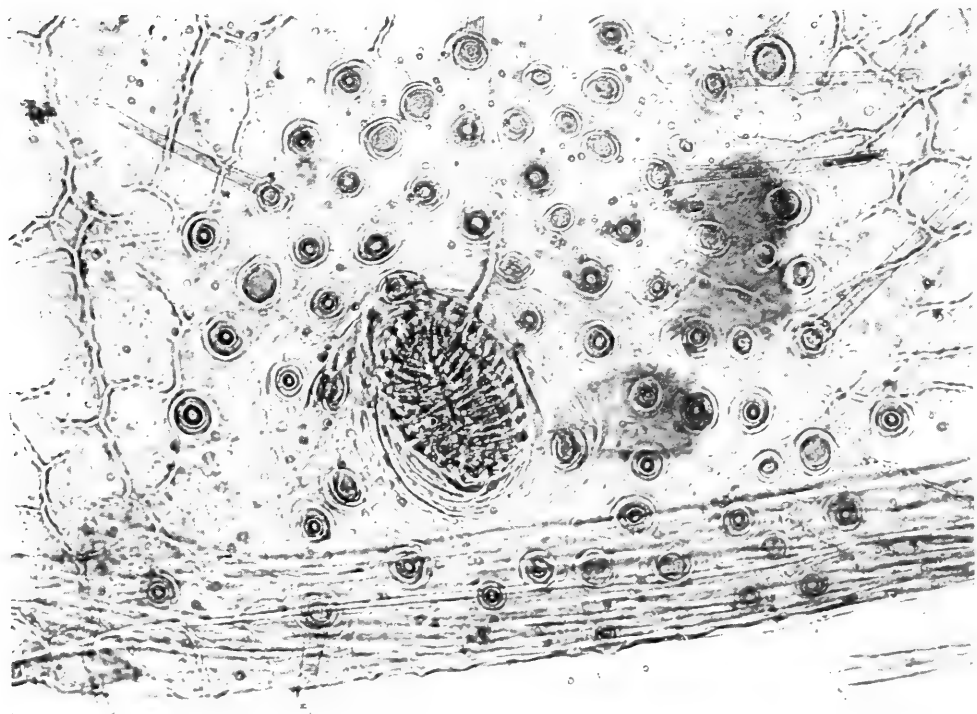
	FROM FRONT (along dorsum).	WIDTH.	HEIGHT (dorsum to venter).
Front of prothorax .. ..	0.1mm.	—	—
Front of mesothorax .. ..	1.0mm.	2.5mm.	—
Top of mesothorax .. ..	1.8mm.	3.4mm.	3.6mm.
Posterior margin of mesothorax .	2.8mm.	3.5mm.	—
Middle of metathorax .. ..	3.6mm.	3.6mm.	—
Front of 1st abdominal .. ..	4 mm.	—	3.4mm.
Front of 2nd abdominal .. ..	4.4mm.	—	—
Front of 3rd abdominal .. ..	5.4mm.	3.8mm.	—
Front of 4th abdominal .. ..	6.4mm.	—	—
Front of 5th abdominal .. ..	7.4mm.	3.0mm.	3.7mm.
Front of 6th abdominal .. ..	8.2mm.	—	—
Front of 7th abdominal .. ..	9 mm.	—	—
Front of 8th abdominal .. ..	9.5mm.	1.6mm.	—
Front of 9th abdominal .. ..	10 mm.	—	—
End of pupa .. ..	10.2mm.	—	—

(Chapman). The pupa is nearly cylindrical, though rather wider than deep, rounded at the ends, 10mm. long and 4mm. wide across the abdomen; the back of the thorax rises with a round curve, and drops a little at the waist, the abdomen going in a curve to the tail; the wing-cases rounded, the pupa-skin, especially at the wing-cases, very delicate and shining; colour generally pale green, head pale brownish, wing-cases with a very faint brown tinge, a dark green line down the middle of the back of the abdomen, the spiracles whitish, a few short bristles scattered on the skin (Hellins). The pupa is rounded at both extremities, and is without angles; the anal extremity is without the usual minute hooks for attachment; the region about the head is furnished with minute bristles; the colour is dull green; the head, extremity of wing-cases, and ventral surface of abdomen tinged with brown (Newman, *Ent.*, iii., p. 15).

COMPARISON OF PUPA OF POLYOMMATUS ICARUS WITH PUPÆ OF AGRIADES THETIS AND *A. CORIDON*.—The pupa is very similar to that of *Agriades thetis* or *A. coridon*, especially in the apparent want of hairs and the absence of any cremastral hooks; rosettes are also scarce. It is easily distinguished by the character of the hairs; this is most marked in the prothorax, where the hairs, simple or slightly clubbed on *A. coridon* and *A. thetis*, have here the club well clothed with comparatively long spicules; the hairs round the spiracles are somewhat

intermediate in length between those of *A. thetis* and *A. coridon*, but are decidedly sharp-pointed; most of them have comparatively sharp points, in the other species they are almost without exception thick and rounded at the ends, least so in *A. coridon*. The cremastral area, though without hooks, has a few ordinary hairs and some rosettes. There is present a small dorsal headpiece, spindle-shaped (about 0.8mm.  $\times$  0.2mm., portion of one side), attached to the anterior margin of the prothoracic piece. This piece is so liable to be lost that failure to see it must not be taken to imply its absence in other species, it is probably present in the pupæ of all these Plebeids. In a mounted pupa of *A. coridon* the dorsal pieces are attached to the face head-pieces (see pl. viii), in my mounted specimens of *A. thetis* it is wanting, but it is easily seen in some undamaged pupa-cases. Across the front of the abdominal segments rosettes are fairly plentiful, but on each side, where hairs are fairly abundant in *A. coridon*, they are here very few (Chapman).

HABITS.—Possibly the best-known “blue” in the British Isles, the habits of *Polyommatus icarus* have been under the notice of numberless races of lepidopterists, and its excited rifling of flowers of thyme, marjoram, clover, and other nectar-bearing plants, its general restlessness, its pugnacious chase of butterflies larger than itself, its habit of sitting on flowers in the hot sun and moving its hindwings wheel-like in evident enjoyment, and its lazy indifference on a warm hazy day, when the sun’s rays find difficulty in filtering through the fine mist, and it rests with its wings not pulled forward nor flattened horizontally as in full glare, but opened sluggishly rather less than halfway, must be known to everybody. That the ♂s usually emerge a few days earlier than the ♀s has been often recorded, not only in Britain, but from the Mediterranean area. The pairing-habit of the species, as we have observed it, is characteristic of the genus, the ♂ attracted to a newly-emerged ♀ pairs without much trouble. Wilkinson’s observation (*Ent. Rec.*, xix., p. 240) is the opposite of ours, for he observes that the ♀, when calling, seems to be very restless, and that on no occasion did a ♂ copulate till after several attempts and after much fidgetting and flying of the ♀, whilst, on one occasion, he noticed the pairing take place during flight, a flying ♀ being joined by four ♂s, one of which united with her when about a yard above the ground. Our own experience has been somewhat different, and, as a rule, we have observed the ♀ to be rather lethargic when a ♂ has paired with her, crawling a little if disturbed, but not taking wing. It is remarkable, however, that, after they are paired, the ♂, whilst on the ground, appears to be at the mercy of the ♀, who moves sometimes a considerable distance before she finds a suitable place for resting when she has been disturbed, and drags the ♂ after her, but if made to take flight the tables are turned, and it is the ♂ that carries the ♀. When paired and at rest in a vertical position, the ♂ almost always rests uppermost. Pairing usually takes place in the morning, and the pairs remain in copulation some time, being quite conspicuous at the end of the afternoon near the tops of grass culms, knapweed stems, or other upstanding plants. Smallman notes a pair first observed about 4 p.m. on June 8th, 1907, at Eastbourne, which remained *in cop.* till 8 a.m. the following morning. Jenner-Weir records (*Proc. Sth. Lond. Ent. Soc.*, 1892, p. 92) that he once took a ♂ *A. thetis* paired with a ♀ *P.*



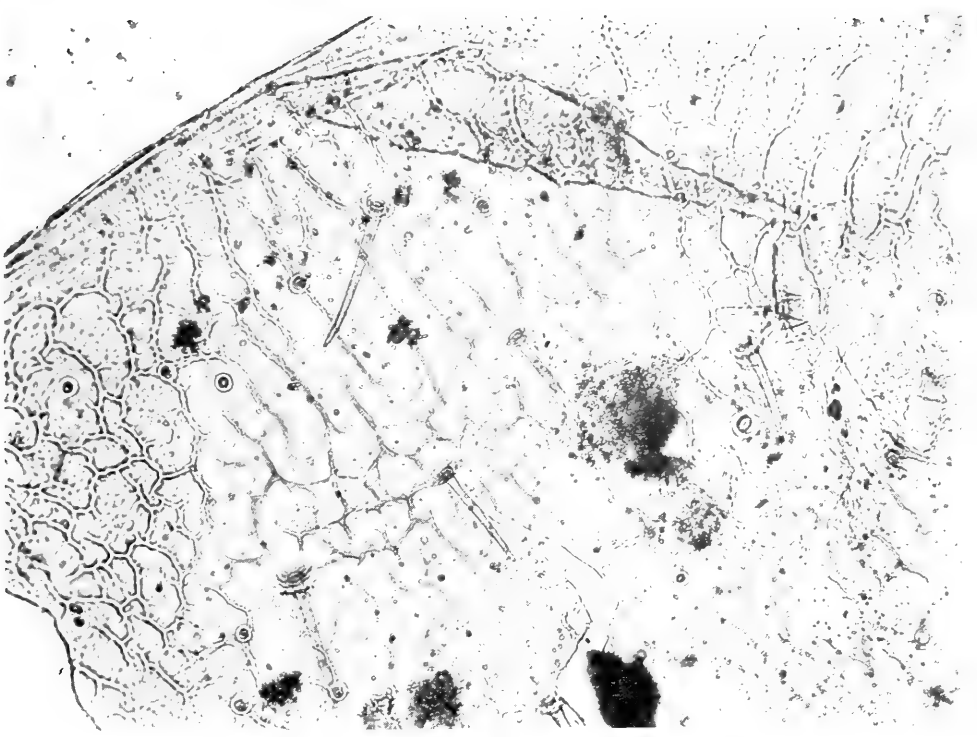
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FIG. 1.—LEFT SPIRACULAR REGION OF 2ND ABDOMINAL SEGMENT OF PUPA  $\times 150$ .

PUPAL DETAILS OF *POLYOMMATUS ICARUS*.

*A Natural History of the British Butterflies, etc., 1910.*

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Photo. F. N. Clark.

FIG. 2.—PORTION OF CREMASTRAL AREA OF PUPA  $\times 100$ .

[To face p. 204.]



*icarus* (see also *Proc. Ent. Soc. Lond.*, 1886, p. xxx, where Jenner-Weir exhibited a ♂ *A. thetis* taken in copulâ with a ♀ *P. icarus* by Mr. Hillman), and we have ourselves noted in the preceding volume of this work, p. 388, a persistent following up of a ♀ by a ♂ *A. thetis* on September 11th, 1909. Mansbridge notes (*Proc. Sth. Lond. Ent. Soc.*, 1898, p. 107) that he observed a ♂ take up the calling position of a ♀, and thus attract other ♂s, possibly the supposed ♂ may have been a very blue ♀. The ♂ of this species, like those of its allies, flies over sloping flowery banks with a quick, somewhat twinkling, movement, its forewings apparently pushed rather back, certainly not thrown well forward, even when making rapid headway, and, viewed from above with the insect below one, it looks as if its blue colour is continuously seen; the wings are pulled upwards and backwards rapidly, and never apparently completely closed, so that the blue is rarely altogether lost when the insect is flying. Looked at sideways, the undersides of the wings are clearly shown as the forward movement is begun, the wings, however, dropping almost immediately, discovering the wholly blue upperside. When thus on flight, it does not seem to make the zigzag movements so characteristic of *Aricia astrarche*, but flies quickly onward, much after the manner of *Polyommatus eros*. On the hazy morning of September 1st, 1907, many apparently freshly-emerged ♂s were observed near Ranscombe, in Kent, with their wings partly opened so as to gain as much heat from the sun as possible, resting on almost anything, grass-culms, scabious leaves, lucerne leaves, etc., the ♀s at this time sat with their wings well up over their backs feeding on the nectar of the thyme-blossoms. The flight of the ♀ is much more difficult to trace and follow than that of the ♂, possibly owing to the dark colour, which, contrasting with the grey of the underside that is brought into view when a forward movement is made, makes the insect more difficult to see against the herbage. The imagines choose a variety of flowers on which to rest and feed, although, perhaps, thyme is, on our Kentish chalkhills, the favourite. On August 15th-16th, 1907, the species was not uncommon on the marshy ground in, as well as on the flowery slopes of, the Val Roseg; the ♂s rested chiefly on the heather blossoms on the banks, but the ♀s appeared to frequent the clover blossom, from which they were very busy extracting the nectar; in the gleams of sunshine, on the 17th, the ♂s were observed in numbers sitting on the apex of a grass or plaitain head, opening their wings to about 90°, so that the sun fell on them, some resting head upwards, others head downwards, others almost horizontal, but all, in such a way, that the sun shone directly on their outspread wings. It is quarrelsome and pugnacious, less so, perhaps, than *Agriades coridon*, and often attacks a butterfly much larger than itself. Smallman says (*in litt.*) that they seem not at all particular as to what kind of flowers or grass they rest upon, when active, usually with the head higher than the body, the wings at about an angle of 90° with each other, and the antennæ in line with the wings, the hindmargins of the hindwings near the body, whilst the forewings are kept fairly well back, so that the hindmargin touches the hindwings for almost its whole length; when in this position, it keeps very still until it flies off, there being, as a rule, no apparent movement of the wings, antennæ, or body. When at rest, with the wings over its

back, the imago of this species pulls back the forewings well within the hindwings, leaving only the three spots of the submedian row and the discoidal spot of the forewings showing. The three spots are in continuous series, not with the corresponding submedian row on the hindwings, but, with the outer marginal row of spots on the hindwings, *i.e.*, the marginal row outside the orange-coloured crescents, whilst the discoidal cell of the forewings is in line with the submedian series of black spots on the inside of the orange crescents of the hindwings. The antennæ are at this time projected in front at rather more than a right angle. When asleep the head is usually downwards, the forewings are drawn so far within the hindwings that the costæ of both wings are in line and the forewings are wholly hidden except for a small area at the extreme apical point. The antennæ are held in front, making an angle of about 90° with the wings, and one of about 45° with each other. Smallman states (*in litt.*) that towards the end of certain afternoons in June, 1907, at about 5.45 p.m., the species was in great abundance, sunning lazily, and scarcely moving if disturbed; shortly after they were asleep on the plant stems, the ♀s appearing to become inert rather before the ♂s. When busily feeding, a butterfly will move quickly round a head of thyme or the capitulum of a composite flower, to get at the nectaries of the different florets. It is a great flower-lover, and, on the Kentish chalk-hills, scabious, centaurea, and the various leguminous flowers—clover, lucerne, etc.—appear to be the favourites, next to thyme, but, in the spring, in the wood-clearings, the ♂s also settle on the blue-bell flowers, in the manner known so well with *Celastrina argiolus*. It is specially attracted to thyme flowers at Cuxton, is very abundant at flowers of lucerne and sainfoin above Grésy-sur-Aix, was common at Torre Pellice at flowers of thyme, marjoram and *Eupatorium*, with swarms of *Rumicia phlaeas*, *Epinephele tithonus*, *E. ianira*, *Melanargia galathea*, *Erebia aethiops*, *Argynnis adippe*, *Dryas paphia*, etc., whilst in the Roseg-thal also, it selected a large variety of flowers, but thyme was here, too, easily first favourite; Norris noticed that it particularly affected sainfoin flowers at Hyères. Slater observes (*Ent. Rec.*, xii., p. 84) that, on the Chiltern Hills, in August 1878, the imagines of this species haunted by preference a very common white umbelliferous flower, whose florets had small intervals between them, so that, when seen from a little distance, it had an ocellated appearance; he adds that, when a “blue” settled on this flower and closed its wings, its ocellated undersurface became almost invisible unless the insect moved.\* Bird records it as being attracted to flowers of *Eupatorium* at Tintern; Mason, that it affects flowers of lavender at Clevedon; and Moore that, at Harlech, he found it on sandbanks, frequenting flowers of *Euphorbia paralias* and *Eryngium maritimum*. In Scandinavia Rowland-Brown noted it on the flowers of an aromatic plant, probably an *Artemisia*, in the valley of the Alten, near Bossekop, but Sparre-Schneider observed it chiefly at *Lotus* and *Vicia* flowers, in company with *Rumicia phlaeas* and *Catastia auriciliella* in the island of Tromsö; no doubt almost any nectar-bearing flower may be attractive to a species with such general tastes.

\* Compare Adkin's remarks on a resting-habit of *Agriades coridon* on umbelliferous flowers at Eastbourne (*Proc. Sth. Lond. Ent. Soc.*, 1894, p. 116).

Occasionally a pollen-mass is found on the head of a specimen of this species, and one suspects that it may play a prominent part in the fertilisation of some flowers. Jenner-Weir exhibited (*Trans. Ent. Soc. Lond.*, 1876, p. xxvi) a specimen that had a hollow horn-like protuberance fixed in front of the head exactly between the antennæ, and was disposed to think it was the theca of a moss from which the operculum had fallen off, and the spores escaped. The species is frequently found at roadside puddles in the Alpine valleys, or at the trickles that run across the paths, though it is rarely really abundant in such places, and is, as a rule, far less common in most of the mountain valleys of Savoy, Switzerland, and Piedmont, than *Agriades coridon*, *Plebeius argyrognomon*, *Aricia astrarche*, *Hirsutina damon* and other allied species. Still, it is generally distributed, and sometimes fairly abundant, *e.g.*, it was quite frequent in Piedmont at the runnels crossing the pathway between Bobbie and Au Pra, with *Polyommatus escheri*, *P. eros*, *P. hylas*, *Agriades coridon*, *Aricia astrarche*, and *Hirsutina damon*, and occurred similarly on the mountains above Au Pra; it was also common in the Dora valley near Pré St. Didier, swilling at the runnels and sitting on the hot, damp sand by the side of the Dora with *Polyommatus escheri*, *P. hylas*, *Hirsutina damon*, *Agriades coridon*, etc. It abounds on the black mud in the bed of the Eaux-Chaudes, just above the Baths at Digne, with swarms of *Agriades coridon*, *Aricia astrarche*, *Scolitantides baton*, etc., in August, and with other species in the late spring. It occurs throughout the main Rhone valley as well as the lateral valleys, and was very common in August, 1899, at the muddy puddles churned by the mules at one of their drinking places near Evolène, but less abundant, perhaps, than *Hirsutina damon*, *Agriades coridon*, *Aricia astrarche*, *Polyommatus escheri*, *Hesperia alveus*, etc., although, in the same valley on August 13th, 1903, we saw the species in greater abundance than anywhere else in the Swiss Alps, at puddles between Useigne and Vex, with the species just mentioned, as well as *Melitaea didyma*, *Epinephela lycaon*, etc., which, however, it altogether outnumbered. It occurred, on August 7th and 9th, 1904, at the runnels in the Saas-Thal, with *Aricia donzelii*, *A. astrarche*, *Plebeius argyrognomon*, *Polyommatus eros*, etc. In the Roseg-Thal, on August 14th, 1907, ♂s of *P. icarus* were sometimes observed at muddy puddles with *Plebeius argyrognomon*, *Agriades coridon*, *Polyommatus eros*, *Aricia astrarche*, *A. donzelii*, etc., the two first-named being its most abundant companions; still more abundant were ♂s of this species a week later in the Via Mala, at the puddles left by the rain of the preceding day, with *Agriades coridon*, and again the following day just below Sils at the entrance to the Albula valley. High up the Dischma-Thal also it occurred at runnels by the roadside with *Plebeius argyrognomon*, *Aricia astrarche*, *Laticlona orbitulus*, *Cyaniris semiargus*, *Vacciniina optilete*, *Albulina pheretes*, and *Agriades coridon*, though not at all abundantly, and numberless similar cases could be cited, *e.g.*, Grum-Grshimailo notes (*Rom. Mém.*, iv., p. 402) that, in the Pamir, on hot days, it collects on the edges of puddles as in Europe. The gregarious assembling of this species, in favourite spots for roosting, must be known to all those who have hunted our southern chalk-downs, where the vegetation, being of a comparatively uniform character, enables an observer with his back to the sun to detect the



groups even at a considerable distance. Special clumps of long grass are frequently selected day after day; still more frequently, probably on account of its greater rigidity in windy weather, the insects choose a thickly-grown heap of *Centaurea nigra*, clumps of which may often be found literally crowded with specimens at rest on all parts of the plant; we have counted as many as 100 examples of *Polyommatus icarus*, and a score of *Rumicia phlaeas*, and as many *Aricia astrarche*, in the space of about three yards square, on a large clump of marram-grass near the sea between Deal and Sandwich; and 50 *P. icarus*, and as many of *Agriades thetis*, in a single small hollow overgrown with *Centaurea nigra* and *C. scabiosa*, on the chalk-downs above Folkestone. It is also to be found on the open Leas at Horsley, towards evening, in numbers, on the tall grass-stems and other coigns of vantage, with *Aricia astrarche* and *Coenonympha pamphilus*, more than two dozen examples of these species being observed on the dead flower-spikes of a single burdock plant. Prideaux notes that on a small clump of *Centaurea nigra*, on August 8th, 1905, at Reigate, he counted 26 specimens of *Polyommatus icarus*, *Aricia astrarche* and *Agriades coridon*, in order of abundance, whilst on Reigate Hill, on August 2nd, 1903, a selected grass-tussock yielded 33 specimens of the same three species. Smallman states that, near Eastbourne, clumps of the dead flowerheads of *Serratula tinctoria* are frequently chosen, whilst Bird notes it as choosing grassheads on which to sleep with *Rumicia phlaeas*, at Tintern; Harrison, on grass, rush and plantain heads at Birtley, and West, on the tall stiff stems of broom at Brockley. Adkin notes (*Proc. Sth. Lond. Ent. Soc.*, 1894, p. 116) that, at Eastbourne, *P. icarus* usually selects the masses of dry grass-stems on which to rest, and is sometimes a difficult object to detect seated upon them as they wave to and fro in a gentle breeze, but, in some years they are in such abundance, *e.g.*, 1899, that, if one walked through the long grass in the little hollows under the downs after the sun had sunk below the hills, *P. icarus* and *A. coridon* sometimes rose in a cloud that quite bewildered one (*op. cit.*, 1899, p. 46), a statement agreeing almost word for word with Oberthür's description (*Études*, xx., p. 22) of the species on the sea-coast between St. Malo and Cancale, when one walks through the thick clumps of *Carex* on which the butterflies are resting there, and when they fly off to seek a fresh asylum. Just under the sloping downs at Upnor and also near Cuxton and Ranscombe, this butterfly, with *Melanargia galathea*, used often to select the outer edges of a cornfield on which to rest, the ripening stems forming, no doubt, an excellent resting-position. The slow, sleepy flight of this species when thus disturbed is very noticeable, and the difficulty of making the insect move at all after dark, makes Studd's observation (*Ent. Rec.*, xii., p. 26) of the species once being taken at light at Oxtou, near Exeter, the more remarkable.

**HABITATS.**—The habitats of this common species are often described as "everywhere," yet, in spite of its wide distribution—in gardens, meadows, fields, on commons, moorland, heaths, marshes, coast sand-hills, roadside wastes, and high mountain valleys, there are many places where the species is absent and others where it is extremely local, and, in eastern Asia, where there seems no reason for its discontinuance, it is either exceedingly rare or absent altogether; nor is it found in Japan or in the Nearctic region like others of our common

species. In Britain it is generally distributed, more so, perhaps, than any other British butterfly, certainly more so than any other British *Lycænid*, and it is common in the Orkney Islands, as well as the Hebrides. On the continent its habitats are much like those of the British Isles, and vary as greatly, the species being found in almost all suitable spots in Central Europe—France, Holland, Belgium, Denmark, Germany, Switzerland, Austro-Hungary, the Balkan Peninsula, Italy and Russia, as well as in Asia Minor, Syria, Persia, Afghanistan and Baluchistan, but becoming local, rather than common, in Scandinavia, northern Russia, the Altai Valleys, Mongolia and Amurland. Its appearance in island habitats, often in abundance (and where no other *Lycænid* is found), *e.g.*, the Canaries, Scilly Isles, the Hebrides, and the Orkneys, is to be noticed, and Sparre-Schneider's remarks (*Tromsø Mus. Aarshefter*, xv, pp. 24-25) become interesting. He states that the species is common in the southern part of the Island of Tromsø in gardens and meadows, yet it has not been observed on the mainland opposite; it also occurs on the Island of Huko. He believes that in Scandinavia, in the latitude of Tromsø, the species is largely confined to coast habitats, being generally found near inlets of the sea, *e.g.*, at Groto, extending only in the direction of the valleys of Beieren and Saltdalen, and not having been observed inland. Rowland-Brown found the species in a sandy, well-wooded pit close in under the hills, about two miles from Bossekop inland, in the valley of the Alten, chiefly affecting an aromatic plant, apparently an *Artemisia*, with *Plebeius argyrognomon*, *Vacciniina optilete*, *Colias hecla*, etc. The British habitats really need no description; the species still occurs in the corners of enclosed meadows, roadsides, and less frequented lanes on the outskirts of modern London, occasionally finding its way into the open parks although so frequented; on the South and North Downs, rough grassy slopes on the chalk-downs, covered in some places with a tangled confusion of bramble, rose, scabious, ragwort, sainfoin, and other chalk-loving plants, in other places with short vegetation, among which *Poterium*, *Helianthemum*, *Lotus*, *Medicago*, *Hippocrepis*, and other plants flourish, are always a chosen haunt of this species. Between Strood and Ranscombe the species abounds on the chalk slopes of the outskirts of the wood, as well as on the edge of the clover and lucerne fields, and indeed on almost any piece of real waste ground or ground under cultivation for fodder crops. It also loves the clearings in the woods that top the chalk-hills everywhere in this district, as well as the wide, open, flowery paths, and the rough slopes that *Agriades thetis* and *A. coridon* also prefer. Similarly, on the downs at Winchester, the insect is abundant with *Cupido minimus*; and at Folkestone, is very common in the sheltered hollows at the foot of the downs as well as in the Warren, the ♀s here being usually very variable; the species occurring with an abundance of *A. thetis*, both in May-June, and in August-September. Indeed, on the downs, it may be truly said to occur in every meadow, and on every grassy hillside, and James says that it occurred in myriads at the end of July, 1899, in the flowery hollows on the hillsides near Betchworth. Not that these are its only habitats in the south, for, in early August, 1896, it swarmed equally on the heaths of Broadwater Forest. Another characteristic locality is the coast sandhills, where among the higher marram-covered mounds,

flat areas, carpeted with *Lotus*, dwarf *Ononis*, *Hieracia*, etc., provide a home for thousands of this species; we have seen it in hundreds resting at sunset on the marram culms on the sandhills stretching between Deal and Sandwich, and within a dozen feet of the water at high tide. It occurs similarly on the downs of Essex and Suffolk, and Woodforde found it swarming on the sandhills near Abersoch, in June, 1900; whilst Fletcher found it in a similar habitat at Tetuan, in Morocco, among the coarse grass. As a far different habitat, we may notice that it occurs all over the Lizard promontory, although usually much less common than *Plebeius argus (aegon)*, whilst Daws observed that it swarmed, in 1898, in the Penzance district. Another strange locality where the species is abundant is in Chippenham Fen, the paths through which, being made up of gault, chalk, etc., carry an exceedingly rich chalk flora, on which *Polyommatus icarus*, *Rumicia phlaeas*, *Pyrausta purpuralis*, and many other unexpected species flourish exceedingly; Wilkinson also notes that the species abounds on the site of the old West Cumberland Ironworks, near Workington, the old tip-heaps being carpeted with *Ononis*, *Lotus*, *Silene*, etc.; Arkle records it as occurring with *Plebeius argus (aegon)* in Delamere Forest, he also found it on the borders of a Northumbrian moor, near Bellingham, on a piece of rough ground covered with knapweed, scabious, galium, St. John's wort, harebell, yarrow, and thistles, all in full bloom, flying with *Pieris napi* and *P. rapae*. In Scotland, it occurs on the slopes of the mountains of the Western Highlands as well as on the "*tiphon*" moors; it is more particularly abundant, however, as a coast species, being common on the Aberdeen and Fife coasts with *Aricia artaxerxes*, *Coenonympha pamphilus*, etc.; whilst Dalglish says that, at the end of July, 1899, it was exceedingly abundant in South Ayrshire, in moist hollows, as well as on parched and dry hillsides, flying out from among the rushes literally in dozens when disturbed. Salwey found it on the moorlands at the foot of Ben Tigh; Rose, in the Rannoch district, in the meadows past the Altmore Falls, where it used to collect on the rushes at dusk to sleep. Kirkaldy found it on some grassy cliffs, on both sides of the Leath Allt, a stream running into the sea on the east coast of Skye, between Staffin and Portree. In Ireland, it is almost as abundant on the cliffs at Howth as on the sandhills of Sligo, where it swarms on the coast, within wash of the waves of the Atlantic; whilst Fletcher noticed it abundant, in cornfields, on the shores of Lough Swilly. Oberthür observes (*Études*, xx., p. 22) that, in France, this species inhabits the mountains and plains, and is particularly abundant by the seaside; the sandy dunes, overgrown with *Carices*, notably between Cancale and St. Malo, produce such a large number of *P. icarus*, that, on some summer evenings if one disturbs the insects when at rest on the *Carex* stems, such numbers arise that they look like a little blue cloud seeking another asylum. Just outside Paris, on the way to Bagneux, the species is abundant in the sainfoin fields, and at Rennes it is still a garden insect. In Guernsey, it occurs on the slopes of "The Gouffre," covered, in spring, with dog-daisies, and bristling with gorse, with *Rumicia phlaeas*, *Callophrys rubi*, *Pararge megera*, etc. In the Bouches-du-Rhône, Siepi says it is common throughout, in woods, on hills and in meadows, indeed it occurs almost everywhere, even in the gardens of the towns. Typical of the localities in Savoy

are the Grésy hills, where, in every meadow, and on every piece of waste ground between the vineyards or running up into the woods, *P. icarus* occurs, whilst in Dauphiny, the species swarms in the hollows at the foot of the mountains filled with tall grass and other herbage just behind Bourg d'Oisans. Far different are its southern haunts in spring, *e.g.*, the glades among the ilex, oak, buckthorn, and southern brooms that cover the limestone hills above the Gard, and where the scent of thyme and rosemary fill the air: or at Costebelle, where the hedgeside roses hang in garlands of cream and white, or along the wood-ridings leading over the hill, occurring with *Glaucopsyche cyllarus*, *G. melanops*, *Aricia astrarche*, *Scolitantides baton*, etc., whilst it is also common on the banks and lavender-covered slopes that lead from the Castle Hill at Hyères to the Plan du Pont, and in the lush meadows by the side of the Siagne, near Pégomas, where it is common in spring, with many other interesting species. In the Hautes-Alpes, on the Crête de Reyasse, the species occurs at a height of almost 7000ft.; where also *Laticornia orbitulus* and *Hirsutina damon* are abundant, and *Loweia alciphron* is found with *Melampias epiphron*, *Colias palaeno*, *C. phicomone* and *Pontia callidice*. In the Basses-Alpes it was abundant in a weedy field just above the "Baths" at Digne, where *Agriades coridon*, *A. thetis*, *Polyommatus hylas*, *Scolitantides baton*, and hosts of other species were flying; also in the little gorge, near where the stream rushes along the floor into the Eaux-Chaudes, as well as in the bed of the stream itself. It also occurred in a meadow on the way between Allos and the Lac d'Allos, between the path and the stream, bordered on the side of the path by a few wych elms and an abundance of blackthorn, where *Chattendenia v-album*, *Nordmannia acaciae*, *Agriades coridon*, *Loweia gordius*, and a host of good species were noticed. In Switzerland its habitats are exceedingly diverse, from the lowlying meadows and fields of northern Switzerland and the hot southern valleys to the mountain slopes often of 7000 ft. elevation. It is, for example, abundant in the fields on the slopes behind Staefa, overlooking Lake Zürich, with *Loweia dorilis* and other common species, and equally abundant in the open spaces in the woods above the Staefa bog, whilst a large form was quite common on the bog itself with *Cyaniris semiargus* and *Lycaena alcon*, probably, here rather a border species than a true bog inhabitant. It abounds in the Rhone valley, *e.g.*, on the flower-covered slopes at the foot of the Grand Salève; equally common near Roche, where it haunted some bush-covered slopes on which *Cyaniris semiargus*, *Melanargia galatea*, and many other species were common; it was also abundant near Sion, on May 30th, 1907, in the meadows and on the railway banks, where they run close to the river below the castle rock, with a whole bevy of "blues"—*Agriades thetis*, *Polyommatus hylas*, *Aricia astrarche*, *Plebeius argus*, *P. argyrognomon*, *Celastrina argiolus*, *Everes alcetas*, etc. Lowe found it in abundance with many other species just below and at the entrance of the wooded slopes above Grindelwald; we found it freely on the north side of the Simplon Pass between Bérisal and the summit, but did not see it on the south side in early August, 1899; it is abundant in the meadows behind Aigle, in June, as well as on the rough slopes between Martigny and Vernayaz, and among the boulders in the huge scarred seam that leads from Chamonix almost to the summit of the Brévent, and Tetley found it

very abundant on Mt. Pélerin, with *Agriades thetis*, *Cyaniris semiargus*, etc.; we found it also on the wooded banks between Andermatt and Hospenthal, and on flowery slopes in the Göschenen-Thal. It occurs throughout Ticino, and above Piotta, and in the Piottino Gorge, appeared on the banks with a crowd of other interesting species, among which the "blues" were represented by *Agriades coridon*, *Cyaniris semiargus*, *Lycaena arion*, *Polyommatus hylas*, *Plebeius argus*, and *Aricia astrarche*. It was also found throughout the Grisons, e.g., on the flower-covered slopes behind Zernetz with *Polyommatus amandus*, *Plebeius argus* var. *killiasi*, *Agriades coridon*, *Hirsutina damon*, *Aricia astrarche*, etc., as well as at the runnels by the wayside far up in the direction of the Ofen Pass, where, in one place, on the banks of a stream, a number of tiny water-rills oozed out, making little wet patches, that crossed a track that indicated a short cut up the valley, and at these damp spots all the "blues" of the valley were assembled—*Polyommatus eros*, *Aricia donzelii*, and *Agriades thetis*, as well as the species already mentioned. In the Roseg-Thal it haunts the steep flowery banks with *Polyommatus eros*, whilst in the marshy bottom near the entrance to the valley, *Plebeius argyrognomon* and *Agriades coridon* appear to be its chief companions. It occurs throughout Austria and Germany, in similar localities to those of England in the plains, and to those of Switzerland in the mountain-valleys, and is mentioned by Dadd as being found on the limestone hills, near Rüdersdorf, as on our own chalkhills, whilst in the Bavarian Alps, near Obersdorf, it occurred on the riverbank at a spot where the river had formed an extensive sandbank overgrown with willow and other bushes, flying with *Lycaena arion*, *Cyaniris semiargus*, *Agriades thetis*, *Cupido minimus*, *Plebeius argus*, *P. argyrognomon*, etc., at the end of June, also in the Oythal, at the junction of the Oy and Trittach, on a sunny bank with an abundance of the same and many other species, on the lower parts of the Seealp, a gradually rising slope leading to the Nabelhorn, as well as in the lower alpine meadows on the side of the Sölleneck, with *Erebia melampus*, *Colias phicomone*, *Coenonympha iphis*, *C. satyrion*, etc. It is found in very early spring in the Val d'Ombia, in Hercegovina where the vegetation is much like that of the Italian Riviera. It occurs also on suitable ground throughout Corsica and Sardinia, a fine race being found on the waste ground about Ajaccio, as well as on the railway banks near Vizzavona. In northern Italy, its habitats are just like those of Switzerland, and Wheeler mentions it as occurring in the Apennines in the plain below Assisi, on the outskirts of the meadows of vetch, with *Plebeius argus*, *Rayvardia telicanus*, *Melanargia galatea*, etc. He also took it throughout the Abruzzi, in plain and mountain, from 1200ft.-4200ft., in abundance at Subiaco, on the site of Nero's Villa, and in Rome in the gardens on the Palatine surrounding the ruined Palace of the Caesars. Its habitats in Spain are equally varied; Mrs. Nicholl says that it occurs in the wooded park outside the palace of the Alhambra at Granada, and on the steep slopes behind the palace, in hollows overgrown with cistus, broom, and lavender; at Gibraltar, it occurs on the Rock (Walker). Assmuss says that it occurs throughout the Moscow, Kaluga, and Tambov Governments of Russia, in wooded districts and in gardens. In Bulgaria, Mrs. Nicholl notes it as being found in

the valley of the Ister, on rough, dry slopes on the southern side of the Vitoch, a long flat-topped mass of granite clothed with wood; also in a splendid butterfly-corner in the Rilska valley, on broken ground overgrown with flowering weeds, and intersected by a little stream. She also records it as occurring in Syria, at Brummana, about ten miles east of Beyrout, 2500 feet above the sea, from which it is not more than four miles distant; also on the rough, half-cultivated ground among terraced fields on the slopes of the Djebel Sunnin. Graves found it in the fields at Jaffa, near the Nahr el Awaj, a pretty mill stream that runs into the sea, a few miles north of the town, where it occurs with *Rumicia phlaeas*, *Lampides boeticus*, and swarms of *Pontia daplidice*, etc.; then it appeared on the wooded railway banks at Dumar, the dry banks covered with flowering crucifers, with *Thais cerisyi*, *Anthocharis belemia* var. *glauce*, etc., and in the Barada valley, between Zebedani and Bludan, occurring on the railway banks, which were covered with thistles and various spiky and aromatic plants, with *Dryas pandora*, *Iphiclides podalirius* var. *virgatus*, etc., whilst again it appeared high up on the mountains east of Baalbek, with *Plebeius nicholli*, *Rumicia phlaeas*, *Powellia orbifer*, *Melitaea didyma*, etc.; it was most abundant on the slopes leading from Ain Zahalta down to the Wadi Safa stream, and occurs abundantly in all the pinewoods round the village, but only occasionally met with on the high slopes to The Cedars, at the summit of Jebel Barouk (7284 feet), but it was abundant, though worn, in the cedar-hollow at the summit where it occurred with beautiful *Cyaniris* var. *antiochena* at 10000ft.; it was found only sparingly on the Zahleh route where it occurred with *Aricia astrarche*, *Plebeius nicholli*, etc., although the localities show a sufficiently varied style of habitat in which the species is to be found in Syria. Grum-Grshimailo says (*Rom. Mém.*, iv., p. 402) that the conditions under which *P. icarus* lives in the Pamir, are the same as those in Europe; flying in fields and resting in the heat by the edges of puddles, etc. It occurs at very different altitudes, in Ferghana it was taken at an elevation of about 1000ft., and on the Beik Col at 4500ft., whilst Saunders took it on the mountains around Chitral at no less an attitude than 10000 ft., as in Syria.

**TIMES OF APPEARANCE.**—It is difficult to quite fix up the broods of this species in the British Islands. It is probable that in the south of England, the species even in most inclement seasons, has a small partial second brood, in average seasons a rather large partial second brood, and in really hot seasons, even a small partial third brood, with some examples of both second and third broods going over the winter as larvæ. Similarly the broods vary in their time of appearance, the first-brood occurring in May and June (early or late according to the season), the second between the end of July and mid-September (similarly early or late according to season), with a possible partial third brood, when the second is well out at the end of July and the autumn remains favourable. It is exceptionally recorded in southern England both earlier and later than the above-named months, occurring for instance in 1893 in North Devon on April 19th (Hincheliff) and on April 25th at Southend (Battley), while it is mentioned on October 4th, 1907, in South Devon by Banks, and in the beginning of October 1909 at Tintern by Bird, when the probability

of a third brood is implied\*. Webb's record (*Ent.*, xxxi., p. 120) of its possible appearance in February 1898 at Dover, may, on the evidence adduced, be safely disregarded. Rowland-Brown gives (*in litt*) the following table, extending over nearly twenty years, of the earliest dates on which the species was observed by him at Pinner (Middlesex), and on the Chiltern Hills, the latter locality being indicated by (C).

	1ST BROOD.	2ND BROOD.	3RD BROOD.		1ST BROOD.	2ND BROOD.
1891..	—	Aug. 11th (to Oc. 7th)	—	1901..	April 23rd	—
1892..	—	July 29th	—	1902..	June 21st	Sept. 6th (C)
1893..	May 6th	July 7th	Sep. 20th	1903..	—	Aug. 31st (C)
1894..	May 7th	—	—	1904..	June 18th (C)	Aug. 13th (C)
1895..	June 3rd	Aug. 15th	—	1905..	June 3rd (C)	Aug. 13th
1897..	June 17th	—	—	1906..	June 7th	Aug. 4th
1898..	June 17th	Sept. 1st	—	1907..	June 10th	Aug. 29th
1899..	May 21st	July 30th	—	1908..	June 6th	—
1900..	May 19th	Sept. 8th	—	1909..	June 16th (C)	Aug. 21st (C)

It will be observed that in this case also the only certain third brood occurs in 1893, though the probability of such a brood is indicated by the dates given in 1891 and 1900. Most writers seem to regard this species as being single-brooded in the whole of Scotland, occurring only in June and July, but Cheesman (an excellent observer) notes (*Ent. Rec.* x., p. 205) that there appear to be two broods even in Orkney, one at the end of May, and the other in July; Traill also (*Ent.* iv., p. 197) mentions it as occurring in Orkney from May to September in 1868. It is also recorded from the Isle of Arran in August and September 1892, though very sparingly (Watson), from the County of Roxborough from June to September (Renton), from Caithness at the end of August (Jackson), etc., and it may be concluded that a second brood, even in the extreme north of Scotland, is not so exceptional as is usually supposed. In Ireland again a single brood is generally considered to be the rule; Sandford (*Ent.* xviii., p. 192), for instance, insists that this is the case in Co. Cork, on the ground that he has searched for it in vain in May and June in the same locality in which it was abundant in August; against this, however, must be set the facts that August is incredibly late for the appearance of a single brood, and that Donovan (*Ent.* xxxiii., p. 143) records the species in June from the same district, though not from the same spot. Kane, again, speaks (*Ent.* xxvi., p. 241) of two broods in Ireland, remarking that the individuals of the second brood are much smaller than those of the first which occurs in June. In Central Europe it may be generally regarded as regularly double-brooded, a third brood being exceptional in the northern parts but becoming more and more frequent towards the south. In the extreme north it is only single-brooded, *e.g.*, in Tromsö far within the Arctic Circle, whence it was

\* The occurrence of a third brood in 1911 would seem to be indisputable; not only is the species recorded by Bernhart-Smith at Birchington on October 3rd, but Grosvenor found it on September 14th at Reigate quite worn out, and fresh and abundant in the same locality on September 23rd (Wheeler).



reported by Sparre-Schneider from June 7th to August 15th in 1891; in 1890 it was not observed earlier than June 11th, and in 1892 as late as August 17th, but in his opinion there was only a single brood in each case, though he found a second brood as far north as Christiania (slightly north of the Orkneys) in August 1876. Bang-Haas reports that it is common in Denmark in May and June, and again in August and September, thus clearly indicating two broods. It is reported by Assmuss to be single-brooded in Russia in the Moscow, Kaluga, and Tambov Governments, though found from June to the end of August; in the Government of Viatka, where it is found from the end of May to August, Kroulikowsky reports it as generally single-brooded, though there is sometimes a supplementary second brood consisting of very small specimens; in the Governments of Kasan and Vologda where he reports it as occurring only in June and July (in the latter case he specifies early July) it is of course only single-brooded. Nolcken, on the other hand, says that it occurs in the Baltic Provinces (Esthonia, Livonia, and Courland) in two broods, from the end of May far into June, and from the end of July to September, and is not scarce. An unaccountable case of apparent single-broodedness is reported by C. Seymour Brown from the Island of Capri, where he has only taken this species in the early summer, though elsewhere at this latitude there are at least three broods, and the species seem specially to flourish in islands. Frey reports it as occurring in Switzerland in two broods up to 7000 ft., with an occasional third autumn brood in September in favourable years and localities, whereas Favre states that it occurs in the Valais from April to October. Wheeler is of opinion that in the plains and the subalpine region there are always three broods, but only two at the higher levels. Indeed, in all places where the first brood appears as early as the first half of April, a third brood may be confidently expected. At Brindisi, for instance, there are at least three broods, as the following notes from Simes (*in litt.*) serve to show:—March 28th, 1905; March 27th, 1906; May 9th, 1910; May 23rd, 1905; June 19th, 1906; July 8th, 1905; Augst 21st, 1906. In localities still further south where the first brood appears early in March, there are at least as many as four broods in the year, as the following notes on the appearance of this species in Malta in 1902, communicated (*in litt.*) by Fletcher will suffice to prove. March 8th, one ♂; March 26th, a few ♂s, worn; April 6th. ♂s common, quite fresh, only one ♀ seen; April 14th, a few, worn; April 17th, one worn ♂ only; May 13th, common and quite fresh; May 15th and 17th, common and fresh; May 24th and June 2nd, common and fresh, some ♂s of the var. *celina*, all ♀s dark; June 7th, common but worn; June 14th, abundant, fresh ♂s of the var. *celina*, fresh ♀s of the var. *rufina*; August 18th, ♂s of the var. *celina* fairly common, but no ♀s seen. From this it would seem that a small first-brood appears early in March, and is worn out in about three weeks, a second emergence, but not necessarily, or indeed probably, a second brood, appearing at the beginning of April; a genuine second brood, the offspring of the March specimens, appears in greater numbers in May, joined later in the month by the off-spring of the April emergence, which show the *celina* form in the ♂s; a third brood, still more abundant than the second, but of a different form in the ♀, begins to



fly in the middle of June, and a fourth, less abundant, appears in the middle of August. The dates given by the same observer for 1901 point, so far as they go, towards the same conclusions; they are as follows: March 20th, one seen; April 5th, one ♂, just out; May 16th, common; July 19th and 27th, common, but very worn: he adds that the species was abundant on June 10th, 1903. As Mathew reports the species in Malta as late as October 2nd, this would almost certainly imply a fifth emergence, but of this we have no direct evidence such as is afforded by the different forms recorded by Fletcher in the previous broods. In the Gibraltar district Walker records that this insect is on the wing from February 12th till November, which implies several broods, but we have no evidence of the probable number. It is reported on March 25th from Jerez (Lang), and on April 6th from Barcelona (Sheldon), but on the central Spanish table-land the earliest date we have found is April 23rd, at Granada (Yerbury); it is also noted by Lang for the same locality in May and by Mrs. Nicholl on June 23rd and 24th; Chapman found it at Albarracín on July 28th and in the middle of the same month at Bejar, and these dates, taken in connection with the fact that Lowe reports it as scarce at La Granja from mid-June to mid-July, which was probably between the broods, would seem to indicate that much the same conditions prevail in the high plateau of Central Spain as in the southern part of the British Isles. On the Riviera it is reported as early as March 17th, 1897 (Chapman) and in the same year on April 17th (Mathew) and from April 30th-May 10th (Buckmaster); as it is also noted as late as October 2nd (Rowland-Brown), three broods may be regarded as certain, with a strong probability of a fourth, in some years at any rate. Elsewhere in Southern France it is noted as early as March 31st, at Pont du Gard and as late as October 18th at Digne, both in 1892 (Rowland-Brown). With regard to the number of broods in North-West Africa it is impossible, with the information at our disposal, to come to any definite conclusion. There are specimens in the Brit. Mus. coll. from Tangier dated "March 1885," and another labelled "Djinina-Sahara iii. '02 (Mrs. Nicholl)" and it is reported at frequent intervals from May 13th to September by Meade-Waldo, Elwes, Gibbs, Oberthür and Miss Fountaine, and as reaching in July to a height of 9000ft. in the Atlas mountains by the former. From the Balkan Peninsula and the neighbouring Greek Islands we have no actual date earlier than May 11th at Athens (Brit. Mus. coll.), and May 12th, at Constantinople, though Graves speaks of the latter as being later than usual. He regards it as being double-brooded in that neighbourhood, the second brood flying in August and September; Mathew, however, reports it from Salonika in mid-October. In Asia Minor Staudinger found two broods, the earlier being first seen on May 10th, and becoming abundant soon afterwards, the latter being equally abundant in July; Miss Fountaine also took this species at Broussa, Amasia and Tokat in May, June and July respectively, but in neither case is any evidence afforded whether it also occurs earlier, or later, or both; Holz, however, reports it as occurring everywhere in Cilicia from March to September. A later emergence is probable in the Island of Cyprus, from which it is reported on April 17th (Mathew) and June 25th (Fletcher). In Syria it is reported from Brummana, not far

from Beyrout, by Mrs. Nicholl, on April 30th, and from Beyrout, by Graves, on July 7th, worn, and again, as being not very common between August 23rd and September 12th; it is further reported from the lowlands at Jaffa, May 10th (Graves) and round Jerusalem from May 29th-July 28th (Swinton); in the mountains it has been taken in May at the Cedars of Lebanon (Nicholl) and July 26th (Day), at 6000ft. in the Lebanon in mid-June (Nicholl) and at so great an elevation as 8500 to 10,000ft. on the summit of the Cedar Mountains, August 26th-28th (Graves). The latter remarks (*in litt.*): "I have never seen *P. icarus* in Egypt, and greatly doubt its occurring there." With regard to its more Eastern habitats, specimens from the Christoph coll. from Shakhuh in the mountains of North Persia are labelled July 8th, 21st and 25th, in different years, whilst others from Seir, eight miles west of Urumiah, in North-West Persia, are labelled August 16th; at Kandahar in South Afghanistan and at Quetta in North-East Baluchistan it occurs from March-October (Swinhoe), whilst in the mountains of Chitral, from 6000 to 10,000ft., it flies in June and July, doubtless in one brood only; it is reported as double-brooded, occurring in May and August, in the Sarafschan district (Glasunow), and also in Ferghana, when it is on the wing in May and June and again in August (Grum-Grshimailo), but somewhat further north at Karamouk, the latter is of opinion that there is one brood only to which the July specimens belong, as he also holds to be the case on the southern slope of the Konjout mountains, and probably in the Pamirs. It is recorded in the Altai, where it appears to be scarce, from Biisk at the beginning of June and from the Tchuja Valley in the middle of the same month (Elwes), but further to the north-east, in the Witim and Wilni districts it is again noted as common in June and July (Herz), the only known specimen from the extreme north-east of its range, taken near Pokrofska (Graeser) in July, seems to approach somewhat closely to the extreme north-western form var. *clara*. The following dates, taken from various sources, will serve to illustrate the foregoing observations, and to indicate the probable times of appearance in the different parts of the range of the species:— June, 1834, at Ste-Marie-aux-Mines, Haut-Rhin (Schreiner); April 4th, 1844, at Messina, June 27th-July 2nd, at Catania (Zeller); June, 1853, in Siberia (Lederer); June 4th, 1860, Sark (F. Walker); July 8th, 1871, Shakhuh, mountains of North Persia (Christoph coll.); May 14th, 1872, at Avignon, May 16th, 1872, at Marseilles, June 11th-17th, 1872, at Naples, June 24th-27th, 1872, at Florence, June 28th and 29th, 1872, at Lucca, July 5th, 1872, at Ravenna, July 12th, 1872, at Bellagio (F. Walker); August 9th-12th, 1872, on Mt. Pilatus, August 12th, 1872, at Meyringen, August 13th, 1872, at Amsteg (Lang); June 23rd-30th, 1873, in Alderney, by far the most abundant species (Luff); August 21st, 1875, end of May and beginning of June, 1876, at Bornich (Fuchs); July 21st, 1878, Shakhuh (Christoph coll.); June 3rd-15th, 1880, in the Visp and Saas valleys (Jordan); March 28th, 1881, at Quetta (Brit. Mus. coll.); May 12th, 1882, at Lambes-a, May 16th, 1882, at Philippeville (Elwes); 2nd week in March, 1883, at Gibraltar (Walker); May 23rd, 1884, at Jussy (Reverdin); March, 1885, at Tangier (Brit. Mus. coll.); May, 1886, on the Lebanon (Pratt); June 4th, 1887, at St. Brelade's Bay, Jersey (Hawes); June 11th, 1887, in the Pamirs (Grum-Grshimailo); July 25th, 1887,

Shakhuh (Christoph coll.); September 27th, 1887, a few diminutive ♂s, very fresh, at Wiesbaden (Prideaux); July, 1889, at Visp and Mattmark (Standen); June 4th, 1890, in Sark (Hodges); June 14th-16th, 1890, at Tancarville, Normandy (Leech); May, 1891, at Granada and Langaron, July, 1891, in the Roldal, Norway (F. Walker); June 8th-21st, 1892, at Budapesth (Nicholson); June 9th and 10th, July 17th-20th, 1892, Serafschan (Grum-Grshimailo); April 24th, 1893, in Guernsey (Hodges); June, 1893, in Corsica (Standen); August 1st, 1893, at Bagneux (Tutt); May 22nd, 1894, at San Stefano (Knecht); July 29th, 1894, at Bourg St. Maurice, end of August, 1894, at Grésy-sur-Aix (Tutt); July, 1895, at Kandersteg, the Riffelalp, in the Zmutt-thal, at Randa (Harcourt-Bath); May 25th-29th, 1896, at Grupont, in the Ardennes (Harcourt-Bath); May and June, 1896, in Sicily (Fontaine); May 29th-July 28th, 1896, round Jerusalem (Swinton); August 6th-12th, 1896, at La Grave, August 12th-17th, 1896, in the Romanche Valley, August 18th, 1896, at Bourg d'Aru (Tutt); October 2nd, 1896, at Malta, mid-October, 1896, at Salonica (Mathew); March 17th, 1897, on the Riviera (Chapman); April 16th-29th, 1897, at Digne, ♂s only (Tutt); April 17th, 1897, at Villefranche (Mathew); April 30th-May 10th, 1897, at Costebelle (Buckmaster); June 16th, 1897, at Suda Bay, Crete (Mathew); June 19th-25th, 1897, at Fontainebleau (Tutt); July 22nd-27th, 1897, at Heiligenblut (Lemann); August 10th-19th, 1897, at Susa, scarce, August 23rd, 1897, at Grésy-sur-Aix (Tutt); August 10th, 1897, at Afka, August 26th, 1897, at the Cedars of Lebanon (Day); April 5th, 1898, at Hyères (Rowland-Brown); April 17th, 1898, in Cyprus (Mathew); April 21st, 1898, at the Pont du Gard, just appearing, end of April, 1898, at Auribeau (Tutt); May 22nd-27th, 1898, in Corfu (de la Garde); beginning of June, 1898, at Veytaux (Wheeler); June, 1898, at Saeterstøen (Standen); July 2nd, 1898, at Brig (Poulton); July 20th, 1898, at St. Cergues (Blachier); July 21st, 1898, in the Tchuja Valley, 6000ft., August 7th, 1898, at Biisk (Elwes); August 6th, 1898, Seir, Persia (Günther); August 28th, 1898, in the Val d'Ombia (Nicholl); April 3rd and July 1st, 1899, at Veytaux (Wheeler); May 21st, 1899, on Mt. Vitoch (Bulgaria); June 12th and 26th, 1899, in the Rilska Valley (Nicholl); end of May, 1899, in the Val André, Brittany (D. Turner); June 4th, 1899, at Digne (Rowland-Brown); August 6th, 1899, on the Simplon Pass (Tutt); April 30th-May 2nd, 1900, at Brummana, Syria, May, 1900, at the Cedars of Lebanon, mid-June, 1900, on the Lebanon at 6000ft. (Nicholl); May 11th, 1900, Athens (Brit. Mus. coll.); May and June, 1900, common in most places in Greece (Fontaine); June 21st-25th, 1900, at Salzburg, June 26th-28th, 1900, at Berchtesgaden, June 29th-July 2nd, 1900, at Mödling, July 3rd-9th, 1900, at Budapest, July 12th-20th, 1900, at Herculesbad (Lang); July 6th, 1900, on the north side of the Splugen Pass (Rowland-Brown); July 9th, 1900, Aigle (Rosa); August 9th-16th, 1900, at Abriès, August 19th, 1900, at Grésy-sur-Aix (Tutt); beginning of September, 1900, at Rennes (Oberthür); April 23rd, 1901, at Granada (Yerbury); May 13th, 1901, at Bouveret (Wheeler); May 13th, 1901, at Klasta, May 29th, 1901, at Meduna, June 5th, 1901, at Rehamna, June 29th, 1901, at Amsmiz, July 4th, 1901, at Tsauritz Entsagautz, in the Atlas Mountains, at 9,000ft., July 7th, 1901, at Imentella,

in the Atlas Mountains, at 5500ft. (Meade-Waldo); May 16th, 1901, at Busharin, July 8th, 1901, at Imentella, July 13th, 1901, at Sould Jedid, August 17th, 1901, at Tangier (Elwes); May 18th-20th, 1901, at Granada, June 23rd and 24th, 1901, on Mont Sény (Nicholl); June 3rd, 1901, at Suda Bay, Crete (Fletcher); July 14th, 1901, in the Cevennes (Rowland-Brown); July 28th, 1901, at Albarracin (Chapman); August 8th and 9th, 1901, on Mt. Pilatus (Keynes); August 9th, 1901, at Biedenkopf (Jäger); mid-August, 1901, above Bobbie (Tutt); March 25th, 1902, at Jerez (Lang); May 25th, 1902, at Veytaux (Barraud); June 25th, 1902, at Larnaka, Cyprus (Fletcher); June 26th, 1902, at Aigle (Sheldon); mid-July, 1902, at Bejar (Chapman); August 9th, 1902, at Vallorbe, very worn (Wheeler); October 2nd, 1902, at Beaulieu, Alpes Maritimes (Rowland-Brown); March 28th, 1903, at Hyères, April 6th and 10th, 1903, at Auribeau, April 13th, 1903, at Alassio, April 21st, 1903, at Locarno, May 11th, 1903, at Ollon, May 14th, 1903, in the Pfynwald (Tutt); Easter, 1903, in Majorca (Muschamp); May, 1903, at Broussa, June, 1903, at Amasia, July, 1903, at Tokat (Fontaine); June 4th, 1903, Chitral Drosh, 6000 to 10,000ft. (Saunders); July 11th, 1903, at Ajaccio, July 13th, 1903, at Bocagnano, July 26th, 1903, at St. Martin Vesubie (Rowland-Brown); July 27th, 1903, at Roche, July 29th, 1903, in the Val d'Hérens (Tutt); July 27th, 1903, at Rüdersdorf (Dadd); May 4th, 1904, at the Pont du Gard (Chapman); June 29th, 1904, at Macolin, July 2nd, 1904, at Grindelwald (Lowe); July 7th, 1904, at Nahr el Kelb, Beyrout, worn, July 10th, 1904, at Ain Zahalta (Graves); July 8th, 1904, at Mödling (Rowland-Brown); July 14th, 1904, at Nikolsburg, Moravia (Gillmer); July 23rd, 1904, near Bâle, July 26th, 1904, at the Col de la Forclaz, July 28th, 1904, on the Grand Salève, August 5th-7th, 1904, in the Saas Valley (Tutt); August, 1904, at Seb Dou, September, 1904, at Milianah (Fontaine); May 9th, 1905, at the Pont du Gard (Tutt); May 10th, 1905, at Jaffa (Graves); June 14th and 15th, 1905, at Montserrat (Standen); June 26th, 1905, at Oberstdorf, June 27th, 1905, in the Oythal, July 22nd, 1905, on the Solleneck (Dadd); July 11th, 1905, at Igls (Bentall); July 12th, 1905, at Vernet-les-Bains (Rowland-Brown); July 12th and August 10th, 1905, in the Val Antigorio (Blachier); July 25th, 1905, at Salins (Reverdin); August 1st, 1905, at Bourg St. Maurice (Tutt); April 24th, 1906, at Granada (Yerbury); June 26th, 1906, at Jönköping, June 29th, 1906, at Vaxholm, July 12th and 19th, 1906, at Abisko, July 21st, 1906, at Alten (Rowland-Brown); July 20th, 1906, at Arolla, August 22nd, 1906, at Martigny (Reverdin); July 30th, 1906, at Clelles, August 4th and 19th, 1906, at Digne, August 10th, 1906, at the Lac d'Allos, worn, August 21st, 1906, at Grésy-sur-Aix, August 24th, 1906, at Versoix, Geneva (Tutt); August 27th, 1906, at Fiesole (Wheeler); May 4th, 1907, at Rocamadour, May 9th, 1907, at the Pont du Gard, May 12th, 1907, at Digne (Rowland-Brown); May 20th, 1907, at Montreux, May 24th, 1907, at Bex, May 29th, 1907, at Sion, May 31st, 1907, at Glion, June 5th, 1907, at Chexbres (Tetley); from June 17th, 1907, at Bérisal (Prideaux); July 8th, 1907, Chitral-Madaglasht, 10,000ft. (Saunders); July 21st and 25th, 1907, at Versoix, Geneva (Reverdin); end of July, 1907, at Aleih (Graves); July 30th, 1907, at Hospenthal, August 4th, 1907, in the Piotta Gorge, August 13th, 1907, at Pontresina, August 14th, 1907, in

the Rosegthal, August 18th, 1907, on the Albula Pass, August 23rd, 1907, on the Via Mala, newly out (Tutt); August 5th, 1907, at Eclépens, August 27th, 1907, at Veyrier (Blachier); September 4th, 1907, Fiesole, September 25th, 1907, at Assisi, worn (Wheeler); April 6th and 7th, 1908, at Barcelona, May 23rd-29th, 1908 at Guéthary (Sheldon); April 11th and 15th, 1908, at Pardigon (Reverdin); June 1st-8th, 1908 near Budapesth, June 9th-14th, 1908 in the Czernathal (Rosa); July 10th, 1908, in the Val d'Ognon, July 23rd, 1908, at Luxeuil, July 30th, 1908, at Charmes (Gibbs); July 27th, 1908, in the Staefa bogs, August 3rd, 1908, in the Dischmathal, August 5th, 1908, in the Sertigthal (Tutt); August 2nd and 4th, 1908, at Barcelonette, August 19th, 1908, on the Dourbes, Digne (Rowland-Brown); August 9th, 1908, at Chamonix (Page); May 18th, 1909, at Martigny, May 21st, 1909, at St. Triphon, May 25th, 1909, at Sonzier, June 1st and 13th, 1909, at Vernayaz, June 2nd, 1909, at Lavey, June 6th, 1909, at Caux, June 18th and 19th, 1909, at Bérissal (Alderson); May 29th, 1909, June 10th, 1909, September 17th, 1909, near Geneva (Blachier); throughout June, 1909, at La Bourboule (Prideaux); June 10th, 1909, on the Voirons, June 15th, 1909, in the Bois des Frères, July 4th, 1909, at Salins (Reverdin); June 24th, 1909, at Assisi, July 3rd, 1909, at Montefalco, July 31st, 1909, a new brood, at Assisi, August 9th, 1909, at Orvieto, August 14th, 1909, at Siena (Wheeler); July 12th and 13th, 1909 at Mouchard, July 14th, 1909, at Poligny, July 15th, 1909, at Lons, July 16th, 1909, at Champagnole (Gibbs); July 25th-August 1st, 1909, at La Grave, scarce (Lowe); July 31st, 1909, in the Pfynwald (Page); August 1st, 1909, at the Col de la Forclaz (Oldaker); August 1st, 1909, on the Arlberg, not common, August 2nd, 1909, in the Moosthal, August 6th, 1909, in the Sarnthal, August 8th, 1909, on the Mendel Pass, August 10th, 1909, at Meran, August 11th, 1909, at Neu Spondinig, August 12th, 1909, on the Ofen Pass (Tutt); August 3rd, 1909, at Le Livran, Cantal, August 7th-19th, 1909, at Mende (Rowland-Brown); May 27th, 1910, at Fontainebleau (Ashby); May 31st and June 1st, 1910, at Tlemcen, Algiers, June 3rd, 1910, at Lallah Maghnia (Gibbs); June 6th, 1910, near Scutari (Graves); June 24th-27th, 1910, at Samoussy (Rowland-Brown); early July, 1910, at Herculesbad (Keynes); July 7th, 1910, at Fiesole, July 8th, 1910, at Terni, worn, July 10th, 1910, at Assergi, July 11th, 1910, at Aquila, July 13th, 1910, at Sulmona, July 14th, 1910, at Scanno, July 15th, 1910, below Villalago, July 18th-25th, 1910, at Roccaraso, July 22nd and 23rd, 1910, at Palena, July 28th, 1910, at Subiaco, August 2nd, 1910, in the Palatine Gardens, Rome (Wheeler); July 17th, 1910, at Hospenthal, July 20th, 1910, on the Oberalp Pass, August 12th, 1910, at Saas-Fée, August 16th, 1910, at Eclépens, quite fresh (Rowland-Brown); July 28th, 1910, on Mt. Vuâche (Tutt); August 23rd and 24th, September 10th-12th, 1911, at Beyrout, not very common (Graves); April, 1911, at Malaga, fairly common, May, 1911, at Granada, common (Jones); June 14th-16th, 1911, at Samoussy, worn out, June 21st, 1911, at Rezzano, June 23rd, 1911, at Faïdo, both worn and fresh specimens, June 27th, 1911, in the Laquinthal, very few, July 1st, 1911, near Bex, July 6th, 1911, at Altmatt, July 7th, 1911, above Fitzbach, July 8th, 1911, near the Lake of St. Moritz (Wheeler); June 30th, 1911, near Angoulême, July 6th-12th, 1911, near Gavarnie, August 1st, 1911, near Bordeaux

(Rowland-Brown). BRITISH LOCALITIES.—August 5th, 1826, in Dorsetshire (Dale); June 28th-August 2nd, 1844, at Charlton (Bedell); September 5th, 1868, near Scarborough (Rowntree); June to end of September, 1868, in the Orkneys, not very common (Traill); May 30th, 1873, Darland Hill (J. J. Walker); June 9th and 11th, 1873, at Dry Drayton (F. Walker); July 1st-14th, 1875, near Kinlock (Wassermann); September 1st, 1875, at Horley (Matthews); August 20th-September 1st, 1877, at Tresco (Crewe); October 4th, 1877, at Wotton-under-Edge (Perkins); June 6th, 1878, at Arreton, Isle of Wight (Rose); August 23rd, 1879, near Winchester (Weston); June 3rd, 1880, at Taynult, Argyll (Salwey); August 21st, 1880, at Eastbourne (Denny); July 2nd, 1884, at Rannoch (Rose); July 8th, 1884, in the Orkneys (Briggs); August 29th, 1884, on Keston Common (Joy); August 12th, 1886, at Ventnor (Cameron); August 19th, 1887, at Cuxton (Tutt); June 10th, 1888, at Brighton (Brazenor); June 23rd, 1888, in Delamere Forest (Arkle); July 13th, 1888, on Lundy Island (F. Walker); June 22nd, 1889, at Keyingham, Yorks. (Boult); May 24th, 1890, at Portland, just appearing (E. W. Brown); May 26th, 1890, at Shoreham (Tutt); August 12th, 1890, at Ramsay, Isle of Man (Jäger); August 30th, 1890, at Folkestone (Carpenter); August 10th-23rd, 1891, at Eastbourne (Adkin); July 22nd and August 5th, 1892, at Swanage (Bloomfield); August 7th, 1892, at Aberdeen, worn (Mutch); August and September, 1892, in the Isle of Arran, three specimens only (Watson); September 19th, 1892, at Swanage (Nicholson); April 19th, 1893, in North Devon (Hinchcliff); April 25th, 1893, at Southend (Battley); May 6th, 1893, in North Kent, July 22nd and August 22nd, 1893, at Cuxton (Tutt); May 6th, 1893, in Epping Forest (Hunt); July 1st, 1893, at Leigh, Essex (Turner); June 9th, 1894, at Reigate (Adkin); July 29th, 1894, at Douglas, Lanark (Mackonochie); September 12th, 1894, at Riddlesdown (Fletcher); May 12th, 1895, in the Isle of Wight (Prideaux); June 17th, 1895, at Riddlesdown (Fletcher); June 20th and 21st, 1895, at Roscrea (Gahan); May 17th, 1896, in the Isle of Man (Clarke); July 23rd, 1896, in Delamere Forest (Arkle); August 11th, 1896, at Swanage (Hall); June 17th, 1897, at Guildford (Drover); June 26th, at Coolmaine Castle, Cork (Donovan); July 10th-24th, 1897, at Barmouth (Imms); August 2nd, 1897, at Shere (Tremayne); June 3rd, 1898, near Leicester (Dixon); June 12th, 1898, at Luce Bay, Wigtownshire (Gordon); June 28th, 1898, at Hythe (Hill); early July, 1898, at Oban, August 12th, 1898, at Ventnor (Cameron); September 17th-24th, 1898, at Reigate, in good condition (Phillips); June 5th, 1899, at Frensham (Newland); end of June and beginning of July, 1899, at Stornoway (Fremelin); July 8th, 1899, at Irvine (Dalglish); July 29th, 1899, at Betchworth (James); June 4th and 16th, 1900, at Guildford (Pickett); June 30th, 1900, in Delamere Forest (Arkle); end of June and beginning of July, 1900, in the Isle of Skye (Sheldon); July 16th, 1900, at Irvine (Dalglish); July 21st, 1900, by Lough Swilly (Fletcher); August 8th, 1901, at Watford (Arkle); June 7th, 1902, at Dorking, July 14th, 1902, on Ranmore Common (Oldaker); September 4th, 1902, at Great Melton (Raynor); September 6th, 1902, at Maidstone (Golding); end of September, 1902, at Salisbury (Carr); June 2nd, 1903, at Folkestone, just appearing, August 12th, 1903, at Dover (Pickett); August 7th, 1903, at Arundel

(Oldaker); August 21st, 1903, at Bellingham (Arkle); June 4th, 1904, at Rame Head (Fletcher); July 7th, 1904, at Witherslack (James); August 8th, 1904, at Tintern (Bird); August 13th, 1904, on Beachy Head (Colthrup); July 14th, 1905, at Durham (Harrison); June 5th-July 19th, 1906, first brood, August 6th-September 4th, second brood, at Tintern, September 10th, 1906, at Owen's Cross (Bird); August 5th, 1906, at Wimbledon (Smallman); August 24th, 1906, at Chatham (Hamm); September 17th, 1906, on the Sussex Coast (Adkin); May 17th-20th, 1907, in the Wye Valley (Barraud); July 20th, 1907, by Buttermere (Wilkinson); August 10th, and in mid-September, 1907, in Denbighshire (Arkle); September 15th, 1907, at Ranscombe and Halling (Tutt); October 4th, 1907, in South Devon (Bankes); June 20th, 1908, in Swordale, July 29th, 1908, at Nairn (Jackson); May 23rd, 1909, at Halling, June 10th, 1909, at Winchester (Tutt); May 28th, 1909, at Ware (Reuss); June 19th, 1909, at Box Hill (Adkin); August, September and the beginning of October, 1909, at Tintern (Bird); September 1st, 1909, at Munden (Reuss); September 11th, 1909, at Folkestone (Bell); May 20th, 1910, at Abbott's Wood (Alderson); June 8th, 1910, at Bourton-on-the-Water (Wheeler); June 12th, 1910, at Kendal (Littlewood); June 19th, 1910, at Folkestone, scarce (Bell); August 22nd-26th, at Wick, Caithness (Jackson); May 22nd, 1911, at Brasted, May 23rd, 1911, at Oxted, May 31st, 1911, at Bourton-on-the-Water, June 1st, 1911, at Notgrove, June 9th, 1911, at Dorking, worn out, September 2nd, 1911, at Cuxton, September 7th, 1911, at Guildford (Wheeler); June 9th, 1911, at Boscastle (Hammond)\*; August, 1911, in the Scilly Islands (Adkin); August 13th and 18th, 1911, at Missenden (Williams); September 14th, 1911, worn out, September 23rd, fresh and abundant, at Reigate (Grosvenor); September 20th-October 3rd, 1911, at Birchington (Bernhart-Smith).

**DISTRIBUTION.**—This species extends northwards in Europe well into the Arctic circle, being by no means uncommon at Tromsø almost at 70° N., but here apparently confined to the coast. In Siberia it has not been reported from much above 60° N. In an easterly direction it rarely occurs much beyond 90° E., whilst its western range is only limited by the Atlantic Sea-board, including the adjacent islands as far as the Canaries and Madeira. To the south its progress seems to be checked by the Atlas mountains and the desert in Africa, as it is not reported from Cyrenaica or Egypt; it occurs again throughout Syria except in the desert, and thence by northern Persia and northern Baluchistan to the borders of India where its southern range turns abruptly to the north-east, being bounded by the north-western Himalayas, the Thian Shan mountains, the Ala-Tau, and the Altai; here it again turns eastwards and extends sparingly to the Amur district, Witim on the east of Lake Baikal being the last point from which it is recorded as being common. In altitude its range does not extend far above the sea-level in its most northern haunts, but gradually increases southwards, being about 7,000 ft. in the Central European Alps, and reaching 9,000 in the Atlas, and 10,000 in the Lebanon and the north-western Himalayas. In the British Isles it occurs throughout, except in the Shetlands (which appear to produce

\* Amongst these examples is noted (*Ent.*, xliv., p. 273) a perfect gynandromorph, left side ♂, right side ♀ (Wheeler).



no indigenous butterfly), even in many of the outlying islets, where it is often the only *Lycænid*. The following records give its distribution elsewhere.—AFRICA: Algeria—Sidi-bel-Abbès, Collo (Oberthür), Bona (Vallanton), Sebdou, Milianah (Fontaine), Djinina-Sahara (Nicholl), Lambessa, Philippeville (Elwes); Tlemcen, Lallah Maghnia (Gibbs); Canary Islands—(Staudinger) [not mentioned, however, in White's "Butterflies and Moths of Teneriffe"]; Madeira (Brit. Mus. coll.); Morocco—Tangier (Oberthür), Tetuan (Fletcher), Klasta, Meduna, Rehamna, Amsmitz, Imentella, Tsauritz-Entsagautz (Meade-Waldo), Busharin, Sould Jedid (Elwes). ASIA: Afghanistan—Chaman, Kasian, Lora Valley (Swinhoe), Kandahar (Butler), Chitral (Saunders); Asia Minor—Scentari (Graves), Cilicia, everywhere (Holz), Broussa (Zeller), Amasia, Tokat (Fontaine), Marmarica, Smyrna, Artaki, Besika Bay, Tchanak (Mathew), Tchertcher Gorge, Jenikeui plateau, the Kerasdere (Staudinger); Baluchistan—Quetta, Gwal (Swinhoe); Cyprus (Mathew),—Larnaka (Fletcher); Pamirs—Col Beik (Grum-Grshimailo); Persia—near Urumiah (Günther), Shukhuh (Christoph Coll.), Meshed, Nischabur (Rübl); Rhodes (Zeller); Siberia—Altai-Büsk, Tenja Valley (Elwes), Transbaikal—Witim, Wilui (Herz); Pokrofska (Graeser); Syria, generally distributed except in the desert,—Jaffa, Haifa, Beyrout, Aleih, Ain Sofar, Ain Zahalta, the Cedars at 6,400 ft., Baalbek, Bludan, Dumar, Damascus, Reyak, East of Jordan at Ezraa and Deraa (Graves), Jebel Sannin (Cremona), Jerusalem (Swinton), Afka (Day), Brummana (Nicholl); Thibet—Ladak (Bingham); Turkestan—Achal-Tekke distr.—Askhabad (Eylandt), Ala Tau—Lepsa (Haberbauer), Kitschi-Karamouk, Konjout Mtns. (Grum-Grshimailo), East Turkistan—Yarkand (Moore), Kashghar (Grum-Grshimailo), Sarafschan—Pendshakent, Magiandarja, Artutsch, Iskander-Kul, Jagnobdarja (Glasunow). EUROPE: Austria-Hungary—Austria, everywhere (Kollar), Bohemia, common (Nickerl), Dalmatia, common (Aigner-Abafi), Galicia (Nowicki),—round Cracow at Bielany, Pleszow, Przeginia, Zabiezow (Zebrowski); Herzegovina—Val d'Ombra (Nicholl), Hungary, everywhere common (Aigner-Abafi), Silesia everywhere (Neustadt and Kornazki); Balearic Isles—Majorca (Jones); Belgium, throughout (Lambillion); Bulgaria—Mt. Vitoch, Rilska Valley (Nicholl); Channel Islands—Jersey (Hawes), Guernsey, Sark (Hodges), Alderney (Walker); Corsica—Ajaccio (Rowland-Brown), Bastia, Vizzavona (Lang); Crete—Canea, Suda Bay (Mathew); Denmark, common throughout (Bang-Haas); Finland, everywhere common in south, rarer in north, and extending into Lapland (Federley),—Nyland (Tengström), Alands, Abö, Geta, Finström, Jomala, Mariehamn, Sand, St. Karins, Pargas, Naga, Korpo (Reuter); France, common throughout (Berce); Germany, everywhere (Heinemann); Greece, common in most places (Fontaine),—Athens, Eleusis, Phalerum, Platea, Poros (Mathew), Nauplia, Tiryns (Fletcher), Corfu (Simes), Argostoli in Cephallenia, Lemnos (Fletcher); Holland, in all the Provinces, one of the commonest butterflies (Snellen); Italy, everywhere common (Wheeler); Malta (Fletcher); Norway, throughout up to Tromsö, sometimes common, in other years absent (Siebke),—Bergen, Roldal (F. Walker), Dovrefeld (Siebke), Saeterstöen (Standen), Christiania, Tromsö, Huko (Sparre-Schneider), Alten (Rowland-Brown); Portugal—Lisbon (Mathew); Roumania, common throughout (Fleck); Russia—Baltic Provinces, everywhere and not scarce (Nolcken), Crimea (Melioransky), Jaroslav, Pskov, Viatka Govts. (Kroulikowsky), Kaluga, Moscow, Tambov Govts. (Assmuss), Karelia, Russian Lapland (Tengström), Transcaucasia, everywhere (Romanoff), Volga-Ural Provinces—Kasan, Orenburg, Simbirsk, Saratov (Eversmann); Sardinia—Alghero (Matthew), Arunci Bay (Fletcher); Sicily, common (Fontaine), Messina, Catania, Syracuse (Zeller), Palermo (Mathew); Spain—Albarracin, Bejar (Chapman), Cella, Rodenas, Almohaja, Bronchales, Leoparades, Bezas (Zapater), Bilbao (Seebold), Corunna, Ferrol, Vigo (Mathew), Barcelona (Sheldon), Montserrat (Cuni-y-Martorell), Montsény (Nicholl), La Granja (Lowe), Granada (Yerbury), Langaron, Jerez (Lang), Malaga (Jones), Gibraltar (Walker); Sweden, everywhere in the south (Aurivillius), Jönköping, Vaxholm (Rowland-Brown), Swedish Lapland—Abisko (Rowland-Brown); Switzerland, common everywhere up to 7,000 ft. (Frey); Turkey—Gallipoli, Salonika (Mathew), round Constantinople, Küthük-Telikmedje (Graves).

### ERRATA.

- Vol. iv., p. 107, line 13 from bottom, and p. 114, line 11 from top, for ii., pt. 3 read iii., pt. 2.  
 „ „ p. 108, line 5 from top, transfer Dbldy., "Syn. List," 1st ed., p. 1 (1850) from *Lycæna* to *Polyommatus*.



- Vol. iv., p. 108, line 12 from top, *Stn.*, "Man.," i. p. 61 (1857), ditto.  
 " " " " 14 from bottom, delete the whole reference to *Hesperia*.  
 " " p. 114, " 39 from top, delete the reference to Butler's "Catalogue of Diurnal Lepidoptera."  
 Vol. i., p. 229, line 7 from bottom, delete "It occurs in May in the Tyrol and in Switzerland."

Genus: *ARICIA*, R.L.

SYNONYMY.—Genus: *Aricia*, R.L.; "Jena. Allg. Litt. Zeit.," i., no. 35, p. 280 (1817); Hch.-Sch., "Fors. Panz. Ins. Deutch.," clxvi., pl. vii. c (1839); Tutt, "Ent. Rec.," xviii., p. 131 (1906); "Brit. Lep.," viii., p. 313 (1906); x., pp. 154, 156 (1909); "Ent. Rec.," xxi., p. 108 (1909); Chpm., "Ent. Rec.," xxii., pp. 101, 103 (1910). **Papilio**, (?) Scop., "Ent. Carn.," p. 179 (1763); Hufn., "Berl. Mag.," ii., p. 78 (1766); Schiff, "Schmett. Wien.," 1st ed., p. 184 (1775); Schneid., "Sys. Besch.," p. 247 (1785); Schfnb., "Scriba's Journ.," iii., p. 217 (1791); Brkh., "Rhein. Mag.," i., p. 291 (1793); Lewin, "Ins. Gt. Brit.," p. 82, pl. xxxii., figs. 1, 2, 8, 9 (1795); Hüb., "Eur. Schmett.," pl. lxii., figs. 303-306 (1799); Don., "Brit. Ins.," ix., p. 74, pl. cccxxii., fig. 2 (1800); Ill., "Schmett. Wien.," 2nd ed., ii., p. 270 (1801); Hffmsgg., "Ill. Mag.," iii., p. 184 (1803); Herbst., "Nat. Sys. Ins.," xi., p. 217, pl. cccxiii., figs. 4-7 (1804); Ochs., "Schmett. Sachs.," p. 330 (1805); Hüb., "Eur. Schmett.," text, p. 49 (1806); Ochs., "Die Schmett.," i., pt. 2, p. 44 (1808); Don., "Brit. Ins.," xvi., p. 2, pl. dxli., figs. 1, 2 (1813); Jerm., "Butt. Coll. Vade-mec.," pp. 26, 59 (1825). [**Papilio-Plebeius**] **Ruralis**, v. Rott., "Naturf.," vi., p. 10 (1775); Esp., "Eur. Schmett.," i., pt. 2, p. 31, pl. lv. (cont. v.), fig. 7 (1778); Bergs., "Nom.," ili., p. 4, pl. xlix., figs. 7, 8 (1780); Göze, "Ent. Beitr.," iii., pt. 2, p. 74 (1780); Borkh., "Sys. Besch.," i., p. 163, 279 (1788); De Vill., "Car. Lin. Ent. Fn. Suec.," ii., p. 74 (1789); Haw., "Lep. Brit.," pp. 46, 47 (1803). [**Hesperia**] **Ruralis**, Fab., "Ent. Syst.," iii., pt. 1, p. 297 (1793). **Cupido**, Schrank, "Fn. Boica," ii., pt. 1, p. 214 (1801); Kirby, "Syn. Cat.," pp. 363-4 (1871). **Lycaena**, Oken, "Lehrb.," ii., p. 719 (1815); Leach, "Edin. Enc.," ix., pt. 1, p. 130 (1815); Ochs., "Die Schmett.," i., p. 147 (1816); Sam., "Ent. Comp.," p. 242 (1819); Koll., "Schmett. (Estr.," p. 9 (1832); Treits., "Die Schmett.," x., pt. 1, suppl., pp. 70, 236 (1834); Freyer, "Neuere Beitr.," iii., p. 61, pl. cccxxv., figs. 1, 2 (1836); Bdv., "Gen. et Ind. Meth.," p. 11 (1840); Neust. and Korn., "Schmett. Schles.," pp. 49, 116, pl. xxiii., figs. 74a-c (1842); H.-Sch., "Sys. Bearb.," i., p. 124 (1843); Evers., "Fn. Volg.-Ural.," p. 53 (1844); Dup., "Cat. Méth.," p. 32 (1844); Koll. and Red., "Ins. Sud-Pers.," p. 10 (1844); de Scl.-Long., "Enum. Lép. Belg.," p. 4 (1845); Nick., "Lep. Böhm.," p. 19 (1850); Hdnr., "Lep. Eur. Cat. Meth.," p. 14 (1851); Gerh., "Mon.," p. 15, pl. xxv., figs. 3a-4c, pl. xxvi., figs. 1, 2 (1852); Meyer-Dür., "Schmett. Schweiz.," p. 71 (1852); Westw. and Hew., "Gen. Diurn. Lep.," ii., p. 494 (1852); Led., "Verh. zool.-bot. Gesell.," ii., p. 20 (1852); Wllgrn., "Skand. Dagf.," p. 213 (1853); Koch, "Geogr. Verbr.," p. 48 (1854); Mén., "Cat. Mus. Pet.," p. 58 (1855); Koch, "Schmett. Sudw. Deutsch.," p. 30 (1856); Ramb., "Cat. Lép. And.," p. 37 (1858); Speyer, "Geogr. Verbr.," i., pp. 85, 234 (1858); Praun, "Eur. Schmett.," pt. x., pl. iv., figs. 21, 22 (1859); Wilde, "Pflanz. Raup.," ii., p. 41 (1861); Staud., "Cat.," 1st ed., p. 5 (1861); Now., "Mot. Gol.," p. 41 (1865); Rössl., "Schmett. Nass.," p. 15 (1866); Snell., "De Vlind.," i., p. 59 (1867); Berce, "Fn. Fran.," p. 138 (1867); Nolck., "Lep. Fn. Est.," p. 55 (1868); Tengs., "Cat. Lep. Fn. Fenn.," p. 2 (1869); Stange, "Schmett. Halle.," p. 3 (1869); Siebke, "Ent. Reise.," p. 36 (1870); Peyerim., "Lep. Als.," 3rd ed., p. 9 (1871); Staud., "Cat.," 2nd ed., p. 11 (1871); Newm., "Brit. Butts.," p. 123, fig. 41 (1871); Mill., "Cat. Lép. Alp.-Mar.," p. 103 (1872); Siebke, "Beidr. Ins. Nov.," p. 31 (1872); Bang-Haas, "Nat. Tids.," ix., 3rd ser., p. 395 (1874); Curd., "Bull. Soc. Ent. It.," vi., p. 111 (1874); Cuni-y-Mart., "Lep. Barc.," p. 20 (1874); Obth., "Études.," i., p. 23 (1876); Siebke, "Enum. Ins. Nov.," p. 7 (1876); Sand, "Lép. Ber. Auv.," p. 6 (1879); Peyerim., "Lép. Als.," 4th ed., p. 24 (1880); Obth., "Études.," v., p. 23 (1880); Frey, "Lep. Schweiz.," p. 17 (1880); Mosl., "Ill. Brit. Lep.," pt. vii., pl. ii. (1880); Rössl., "Lep. Wiesb.," p. 30 (1881); Spar.-Schm., "Ov. Ned. Amt Lep.," p. 18 (1882); Jourdh., "Lép. Aube.," p. 18 (1883); Lang, "Butts. Eur.," p. 114, pl. xxiv., fig. 9 (1884); Rom., "Mem. Lep.," i., p. 52 (1884); Chrstph., "Rom. Mem. Lep.," i., p. 103 (1884); Berce, "Lép. Fr.," p. 17, pl. iii., figs. 15, 16 (1884); Lampa, "Ent. Tids.," vi., p. 14 (1885); Kane, "Eur. Butts.," p. 41 (1885); Kill., "Ins. Graub.,"

p. 19 (1886); Auriv., "Nord. Fjär.," p. 13, pl. vi., fig. 9 (1888); de Nicév., "Butts. Ind.," iii., p. 69 (1890); Brom., "Butts. Riv.," p. 36 (1892); Reut., "Act. F. F. Fenn.," ix., pt. 6, p. 13 (1893); Rühl., "Pal. Gr.-Schmett.," pp. 260 (1893) and 758 (1895); Leech, "Butts. China," ii., p. 315 (1894); White, "Butts. Ten.," p. 41, pl. ii., fig. 6 (1894); Obth., "Études," xx., p. 24, pl. iv., fig. 51 (1896); Favre, "Macr.-Lép. Val.," p. 18 (1899); Steff., "Bull. Soc. Ent. It.," xxxii., p. 335 (1900); Fleck, "Macr.-Lép. Rumän.," p. 20 (1901); Staud., "Cat.," 3rd ed., p. 83 (1901); Lamb., "Pap. Belg.," p. 228 (1902); Spul., "Schmett. Eur.," p. 63, pl. xvi., figs. 15 a, b (1902); Courv., "Mitt. Schweiz. Ent. Gesell.," xi., pt. 1, p. 24 (1903); Day, "Lep. Chesh.," &c., p. 7 (1903); South, "Brit. Butts.," p. 161, pl. cv., figs. 10-17 (1906); Spar.-Schn., "Troms. Mus. Aarsh.," xxviii., p. 112 (1907); Bingh., "Fn. Ind.," i., p. 337 (1907); Gillm., "Int. Ent. Zeits. Gub.," i., p. 376 (1908); Seitz, "Gross-Schmett.," p. 309, pl. lxxix., k (1909); Rebel, "Berge's Schmett.," 9th ed., p. 68, pl. xiv., fig. 8 (1909). [**Zephyrus**-] **Cyaniris**, Dalm., "Handl. Sv. Vet. Akad.," p. 99 (1816). **Agriades**, Hübn., "Verz.," p. 68 (1818), Stphns., "Illus. Haust.," iv., p. 104 (1834). **Polyommatus**, Godt., "Ency. Méth.," ix., pp. 688, 689 (1819); Stphns., "Illus. Haust.," i., pp. 94, 95 (1828); "Ins. Cat.," ii., p. 25 (1829); Bsdv., "Eur. Lep. Ind.," p. 12 (1829); Meig., "Eur. Schmett.," ii., p. 27, 34, pl. xlviii., figs. 4 a, b (1830); Germ., "Butt. Coll. Vade-mecum," 3rd ed., pp. 116, 117 (1835); Dunc., "Nat. Hist. Brit. Butts.," pp. 243, 244, pl. xxxiv., figs. 1-4 (1835); de Sélys-Longch., "Cat. Lep. Belg.," p. 16 (1837); Ramb., "Faun. And.," p. 266 (1839); Wood, "Ind. Ent.," p. 9, pl. ii., fig. 72, iii., 74, 75 (1839); Westw., "Syn. Gen.," p. 88 (1840); Humph. and Westw., "Brit. Butts.," pp. 114-116, pl. xxxvi., figs. 5-7, xxxvii., figs. 1-6 (1841); Dbldy., "Syn. List," 1st ed., p. 1 (1850); Stphns., "List," 1st ed., p. 2 (1850); 2nd ed., p. 19 (1856); Stn., "Man.," i., pp. 61, 62 (1857); Hein., "Schmett. Deutsch.," i., p. 82 (1859); Kirby, "Man.," p. 103 (1862); Curt., "Brit. Ent.," v., p. 8 (ed. of 1862); Kirby, "Eur. Butts.," p. 50, pl. xiv., fig. 9 (1879); Buckl., "Larvæ," i., p. 116, pl. xvi., figs. 1-1f (1886); Dale, "Hist. Brit. Butts.," p. 73 (1890); Barr., "Lep. Brit. Isl.," i., p. 73, pl. x., figs. 3-3i (1893); Tutt, "Brit. Butts.," p. 179, pl. iii., fig. 5 (1896); Kirby, "Hndbk.," ii., p. 99, pl. xlvi.ii., figs. 1, 2 (1896); Wheel., "Butts. Switz.," &c., p. 38 (1903). **Argus**, Dup., "Pap. Fr.," supp. i., pp. 57, 389, pl. ix., figs. 3, 4 (1832); Bsdv., "Icones," i., p. 60, pl. xiv., figs. 7, 8 (1832); Cant., "Lép. Var.," p. 6 (1833). **Cyaniris**, Scudd., "Hist. Sketch," p. 150 (1875). **Chrysophanus**, Meyr., "Hndbk.," p. 346 (1895).

The name *Aricia* was originally intended to cover the whole of the "blues," and owes its origin to an anonymous review in the *Jenaische Allgemeine Literatur Zeitung* of Ochsenheimer's "Die Schmetterlinge Deutschlands," vol. iv., then lately published, signed only with the initials "R. L."\* The passage runs as follows:—

"Genus ix. *Lycaena*. Here Herr O[chsenheimer] unites the genera *Lycaena*, *Thecla*, and *Hesperia*, Fabr., certainly erroneously. We believe also that we find distinctions in the larvæ which might well have restrained Herr O. from this combination. Family A. is our genus *Aricia*, Family B. remains *Lycaena*, and Family C. is *Thecla*, Fabr."

Notwithstanding the abruptness of this introduction of the name *Aricia*, as if already well-known, this is, so far as can be traced, the first published mention of it. It would appear, indeed, from the review, that the writer had used many MS. names in his own collection, which he was now making public for the first time. No further reference to the name can be found until the equally abrupt, and even

\* With regard to the identity of "R. L.," Prout writes (*in litt.*): "R. L. has been a standing challenge to me for years past. . . . If there had been the slightest clue in contemporary or subsequent literature I should have seized on it with avidity. Like yourself, I have worked Hagen carefully (indeed, repeatedly) for the initials, but without avail; perhaps even these were fictitious. . . . Laspeyres, who equally ably—and anonymously—reviewed an earlier volume of Ochsenheimer in the same periodical (in 1809) was deceased. It is just possible that he had a son who worked with him at the last and succeeded to his collection, but there is not a shred of evidence in that direction." (G. W.).

more casual, use of it by Herrich-Schäffer in the explanation of fig. *c* in pl. vii. of the 146th number of his *Fortsetzung Panzers Insekten Deutschlands*, where it stands thus: "Kopf einer *Aricia* (*agestis*)."  
This, in our opinion, constitutes *medon* (*agestis*), the type of the genus, but even by those who dissent from this ruling, our action in the *Ent. Record*, xviii., p. 131 (1906), would be accepted as conclusive.

The genus *Aricia*, Sav., is sometimes erroneously quoted in Vermes for 1817. Its proper date is 1826, the year in which Savigny's *Système des Annélides* was published, and, though the work was in MS. in 1817, it is quite impossible that the name can have appeared in print before February, the date of R. L.'s review. The question is fully dealt with by Prout, *Ent. Record*, xxi., p. 156. The priority of *Aricia* in Lepidoptera over the same genus in Diptera and Mollusca is of still greater extent, the former having been published in 1830 by Desvignes, and the latter in 1832 by Gray.

The genus *Aricia*, as thus restricted, with *medon* as its type, was defined in *Brit. Butts.*, iii., p. 156, as "the group whose larvæ feed on *Geraniaceae*," and it was there noted as being, next to *Plebeius*, the most distinctly separable section of the group by means of the ancillary appendages. In the present volume also, p. 111, we gave at length Chapman's account of the comparative differential characters, which it is needless to repeat. He also dealt at length (*Ent. Rec.*, xxii., p. 101) with the differences in structure of the Plebeiid (*sensu lato*) ædæagus, his remarks with regard to the present genus being as follows:—

"*Aricia* has a highly characteristic structure, very different from the two we have been considering [*Agriades* and *Polyommatus*]. In this, the portion beyond the zone is much prolonged. It may be noted that, throughout the Plebeiids, the portion of the ædæagus within the zone does not vary much in length in the different species, generally about 0.65mm. in length, it varies in different species from 0.55mm. to 0.8mm., rarely outside these limits. The portion beyond the zone varies much more widely—in *Agriades* about 0.22mm., in *Aricia* it is nearly 0.8mm., longer than the basal portion. It tapers gradually to a point, and appears to have a long lateral opening instead of the nearly terminal one in the shorter examples. . . . *Anteros* and *isaurica* have a very similar ædæagus."\*

In vol. iii., p. 156, we placed *idas*, *donzelii*, and *eumedon* with *medon* (*astrarche*) in this genus, and in the article quoted above, Chapman observes that these are the only species that unquestionably belong here, but adds that *isaurica*, *hyacinthus*, *fulla*, and *anteros* may do so. Graves has since shown *Erodium* to be the foodplant of the larva of the first-named, which seems conclusive for that species in connection with the form of the genitalia, and we provisionally include the other three species also.†

The Ariciid egg differs somewhat from the usual Plebeiid type in not being quite flat at the top. It is possible that this slightly domed form indicates Theclid affinities, traces of which Chapman also finds in the lengthened form of the ædæagus, and which are further suggested by the dark colouring of some of the species, *idas* and *eumedon* as well as *medon*, which, however, passes through the dull grey-blue

\* See pl. x., fig. 4 (facing p. 111).

† Chapman definitely states (*in litt.*, June 3rd, 1912) that *fulla* is an *Aricia* (G. W.).

of *fulla* and *donzelii*, and the somewhat brighter colouring of *anteros* and *hyacinthus*, to the bright blue of *isaurica*. The Ariciid larva, again, has its distinguishing character even in its earliest stage where such differences are least to be expected. On this subject Chapman makes the following observations:—

In the first instar, the notable point, as compared with other Plebeiid larvæ, is the length of the dorsal hairs, which are a fourth longer than those of *icarus*, in particular the hairs representing iii (which are so small as to be difficult to find in *Agriades* and very small in *Polyommatus*, and usually clubbed or rounded), are here definite hairs, the front one over 0.11mm. long (dorsal hairs 0.26mm.), the posterior 0.03mm. or thereabouts, really very short, but pointed and hairlike. The prothoracic plate, besides the usual two pairs of hairs and pair of lenticles, has two small hairs in front, and the special angular hairs well developed, being in these respects practically identical with *icarus* (Chapman).

The above observations are founded on the egg and larva of *medon*, but the only other species of the genus which there has as yet been any opportunity of examining minutely, the egg of *idas* and the first instar of *eumedon*, have been found by Chapman to be in agreement with the distinctions here given. No special features have been found in the Ariciid pupa as compared with other Plebeids.

SYNONYMY.—Species: **Medon**, Hüfn., "Berl. Mag.," ii., p. 78 (1766); (?) v. Rott., "Naturf.," vi., p. 10 (1775); Esp., "Schmett. Eur.," i., pt. 2, p. 31, pl. lv. (cont. v.), fig. 7 (1778); Schneid., "Sys. Besch.," p. 247 (1785); Brkh., "Sys. Besch.," i., pp. 163, 279 (1788); ii., p. 230 (1789); De Vill., "Car. Lin. Ent. Fn. Suec.," ii., p. 74 (1789); Schfnb., "Scriba's Journ.," iii., p. 217 (1791); Brkh., "Rhein. Mag.," i., p. 291 (1793); Herbst., "Nat. Sys. Ins.," xi., p. 217 pl. cccxiii., figs. 4-7 (1804); Meig., "Eur. Schmett.," ii., p. 27, pl. xlviii. figs. 4 a, b (1830); Staud., "Cat.," 1st ed., p. 5 (1861); Kirby, "Man.," p. 103 (1862); Led., "Wien. Ent. Monats.," vii., p. 17 (1863); Now., "Mot. Gal.," p. 41 (1865); Rössl., "Schmett. Nass.," p. 15 (1866); Snell., "De Vlin.," i., p. 59 (1867); Zell., "Ent. Mo. Mag.," iv., p. 73 (1867); Berce., "Fn. Fr.," i., p. 138 (1867); Nolck., "Lep. Fn. Estl.," etc., p. 55 (1868); Tengs., "Cat. Lep. Fn. Fenn.," p. 2 (1869); Stange, "Schmett. Halle.," p. 3 (1869); Staud., "Hor. Soc. Ent. Ross.," vii., p. 52 (1871); Newm., "Brit. Butts.," p. 123, fig. 41 (1871); Mill., "Cat. Lep. Alp.-Mar.," p. 103 (1872); de Nicév., "Butts. Ind.," iii., p. 69 (1890); Nich., "Ent. Rec.," xiii., p. 209 (1901); Courv., "Ent. Zeits.," xxiv., p. 112 (1910). \***Alexis**, (?) Scop., "Ent. Carn." (var. 1), p. 179 (1763); (?) v. Rott., "Naturf.," vi., p. 22 (1775); †Led., "Verh. zool.-bot. Gesells.," ii., p. 20 (1852); Hein., "Schmett. Deutsch.," i., p. 82 (1859); Kirby, "Syn. Cat.," p. 363 (1871); Seud., "Hist. Sketch.," p. 150 (1875); Dale, "Hist. Brit. Butts.," p. 73 (1890); Kirby, "Hndbk.," ii., p. 99, pl. xlviii., figs. 1, 2 (1896). **Agestis**, Schiff., "Schmett. Wien.," 1st ed., p. 184 (1776); Göze, "Ent. Beitr.," iii., pt. 2, p. 74 (1780); Hübn., "Eur. Schmett.," pl. lxii., figs. 303-306 (1799); Ill. "Schmett. Wien.," 2nd ed., ii., p. 270 (1801); Schrank, "Fn. Boica.," ii., pt. 1, p. 214 (1801); Hffmssgg., "Ill. Mag.," iii., p. 184 (1803); Ochs., "Schmett. Sachs.," p. 330 (1805); Hübn., "Eur. Schmett.," text, p. 49 (1806); Ochs., "Die Schmett.," i., pt. 2, p. 44 (1808); Dalm., "Handl. Sv. Vet. Akad.," p. 99 (1816); Hübn., "Verz.," p. 68 (1818); Godt., "Ency. Méth.," ix., p. 689 (1819); "Pap. Fr.," i., p. 213, pl. xxxviii., fig. 80 c-f (1821); Stphns., "Illus. Haust.," i., p. 94 (1828); "Ins. Cat.," ii., p. 25 (1829); Bsdv., "Eur. Lep. Ind.," p. 12 (1829);

\* See note on this name *suprà*, p. 114.

† Lederer attributes this name, as he persistently does all von Rottemburg's names, to Hüfnagel. Von Rottemburg's article in the *Naturforscher* was avowedly founded on Hüfnagel's *Tabellen*, but he gives many names not used by the latter, of which Lederer seems not to have been aware. He appears to have had no first-hand acquaintance with Hüfnagel's work.

Koll., "Schmett. Œstr.," p. 9 (1832); Dup., "Pap. Fr.," Supp. i., p. 57 (1832); Cant., "Lép. Var.," p. 6 (1833); Treits., "Die Schmett.," x., pt. 1, suppl., p. 236 (1834); de Vill. and Guen., "Tab. Syn.," p. 20 (1835); Dunc., "Nat. Hist. Brit. Butts.," p. 243, pl. xxxiv., fig. 1 (1836); de Sélong., "Cat. Lép. Belg.," p. 16 (1837); Freyer, "Neuere Beitr.," iii., p. 61, pl. ccxxxv., fig. 1 (1839); H.-Sch., "Fors. Panz. Ins. Deutsch.," cxlvi., pl. vii. c (1839); Ramb., "Faun. And.," p. 266 (1839); Wood, "Ind. Ent.," p. 9, pl. ii., fig. 72 (1839); Bsdv., "Gen. et Ind. Meth.," p. 11 (1840); Westw., "Syn. Gen.," p. 88 (1840); H.-Sch., "Förn. Fn. Rat.," iii. p. 154 (1840); Humph. and Westw., "Brit. Butts.," p. 114, pl. xxxvi., figs. 5-7 (1841); Neust. and Korn., "Schmett. Schles.," p. 49, pl. xxiii., figs. 74 a-c (1842); H.-Sch., "Sys. Bearb.," i., p. 124 (1843); Evers., "Fn. Volg.-Ural.," p. 53 (1844); Dup., "Cat. Méth.," p. 32 (1844); de Sélys-Long., "Enum. Lép. Belg.," p. 4 (1845); Koll. and Red., "Ins. Süd-Pers.," p. 10 (1849); Nick., "Lép. Böhm.," p. 19 (1850); Dbldy., "Syn. List.," p. 1 (1850); Stphns., "List.," 1st ed., p. 2 (1850); Hdnr., "Lép. Eur. Cat. Meth.," p. 14 (1851); Gerh., "Mon.," p. 15, pl. xxvi., figs. 1 a-c (1852); Meyer-Dür., "Schmett. Schweiz.," p. 71 (1852); Wilgrn., "Skand. Dagf.," p. 213 (1853); Reutti, "Lép. Fn. Baden.," p. 41 (1853); Koch, "Geogr. Verb.," p. 48 (1854); Mén., "Cat. Mus. Pet.," p. 58 (1855); Koch, "Schmett. Sudw. Deutsch.," p. 30 (1856); Stphns., "List.," 2nd ed., p. 19 (1856); Stn., "Man.," i., p. 61 (1857); Ramb., "Cat. Lép. And.," p. 37 (1858); Speyer, "Geogr. Verb.," i., p. 85, 234 (1858); Wailes, "Cat. Lép. Northd. Durh.," p. 23 (1858); Dbld., "Syst. List.," p. 2 (1859); Praun, "Eur. Schmett.," pt. x., pl. iv., figs. 21, 22 (1859); Wilde, "Pflanz. Raup.," ii., p. 41 (1861); Curt., "Brit. Ent.," v., p. 8 (ed. of 1862); Siebke, "Ent. Reise.," p. 36 (1870); Cuni-y-Mart., "Lép. Barc.," p. 20 (1874); Obth., "Études.," i., p. 23 (1876); Weston, "Ent.," xii., p. 85 (1879); Obth., "Ét.," v., p. 23 (1880); Mosley, "Illus. Brit. Lép.," pt. vii., pl. ii., figs. 1-5 (1880); Berce, "Lép. Fr.," p. 17, pl. iii., figs. 15, 16 (1884); Buck., "Larvæ.," i., p. 116, pl. xvi., figs. 1-1f (1886); Barr., "Lép. Brit. Isl.," i., p. 73, pl. x., figs. 3-3b (1893); Obth., "Ét.," xx., p. 24, pl. iv., fig. 5 (1896); "Lép. Comp.," iv., p. 244 (1910). **Astrarche**, Bergs., "Nom.," iii., p. 4, pl. xlix., figs. 7, 8 (1780); Staud., "Cat.," 2nd ed., p. 11 (1871); Peyerim., "Lép. Als.," 3rd ed., p. 9 (1871); Bang-Haas, "Nat. Tids.," 3rd ser., ix., p. 395 (1874); Curò, "Bull. Soc. Ent. It.," vi., p. 111 (1874); Siebke, "Enum. Ins. Norv.," iii., p. 7 (1876); Kirby, "Eur. Butts.," p. 50, pl. xiv., fig. 9 (1879); Sand, "Lép. Ber. Auv.," p. 6 (1879); Peyerim., "Lép. Als.," 4th ed., p. 24 (1880); Spar.-Sch., "Troms. Mus. Aarsh.," iii., p. 64 (1880); Alph., "Hor. Soc. Ent. Ross.," xvi., p. 386 (1881); Rössl., "Lép. Wiesb.," p. 30 (1881); Spar.-Schn., "Ov. Ned. Amt Lép.," p. 18 (1882); Schöyen, "Troms. Mus. Aarsh.," v., p. 13 (1882); Jourdh., "Lép. Aube.," p. 18 (1883); Lang, "Butts. Eur.," p. 114, pl. xxiv., fig. 9 (1884); Rom., "Mem. Lép.," i., p. 52 (1884); Chrstph., "Rom. Mem. Lép.," i., p. 103 (1884); Lampa, "Ent. Tids.," vi., p. 14 (1885); Kane, "Eur. Butts.," p. 41 (1885); Kill., "Ins. Graub.," p. 19 (1886); Auriv., "Nord. Fjær.," p. 13, pl. vi., fig. 9 (1888); Reut., "Bidr. Macr.-Lép. Fn. Vas. Finl.," p. 14 (1890); Brom., "Butts. Riv.," p. 36 (1892); Staud., "Iris.," v., p. 280 (1892); Reut., "Act. F. F. Fenn.," ix., pt. 6, p. 13 (1893); Röhl., "Pal. Gr.-Schmett.," pp. 260 (1893) and 758 (1895); Leech, "Butts. China.," ii., p. 315 (1894); White, "Butts. Ten.," p. 41, pl. ii., fig. 6 (1894); Meyr., "Hndbk.," p. 346 (1895); Tutt, "Brit. Butts.," p. 179, pl. iii., fig. 5 (1896); Bachm., "Soc. Ent.," xi., p. 151 (1896); Favre, "Macr.-Lép. Val.," p. 18 (1899); Steff., "Bull. Soc. Ent. It.," xxxii., p. 335 (1900); Fleck, "Macr.-Lép. Rumän.," p. 20 (1901); Staud., "Cat.," 3rd ed., p. 83 (1901); Rond., "Cat. Lép. Pyr.," p. 42 (1901); Spuler, "Schmett. Eur.," p. 63, pl. xvi., figs. 15 a, b (1902); Lamb., "Pap. Belg.," p. 228 (1902); Day, "Lép. Chesh.," &c., p. 7 (1903); Courv., "Mitt. Schw. Ent. Gesells.," xi., pt. i., p. 24 (1903); Wheel., "Butts. Switz.," &c., p. 38 (1903); Harr., "Ent. Rec.," xviii., p. 280 (1905); xviii., p. 236 (1906); South, "Brit. Butts.," p. 161, pl. cv., figs. 10-17 (1906); Spar.-Schn., "Troms. Mus. Aarsh.," xxviii., p. 112 (1907); Bingh., "Fn. Ind.," i., p. 337 (1907); Gillm., "Int. Ent. Zeits. Gub.," i., p. 376 (1908); Grund, "Int. Ent. Zeits. Gub.," ii., p. 79 (1908); Rebel, "Berge's Schmett.," 9th ed., p. 68, pl. xiv., fig. 8 (1909); Seitz, "Gross-Schmett.," p. 309, pl. lxxix., k (1909). **Artaxerxes**, Fabr., "Ent. Sys.," iii., pt. i., p. 297 (1793); Lewin, "Ins. Gt. Brit.," p. 82, pl. xxxix., figs. 8, 9 (1795); Haw., "Lép. Brit.," p. 47 (1803); Don., "Brit. Ins.," xvi., p. 2, pl. dxli., figs. 1, 2 (1813); Leach, "Edin. Ency.," ix., pt. i., p. 130 (1815); Godt., "Ency. Méth.," ix., p. 688

(1819); Sam., "Ent. Comp.," p. 242 (1819); Germ., "Butt. Coll. Vade-mec.," pp. 26, 59 (1824); Stphns., "Illus. Haust.," i., p. 95 (1828); "Ins. Cat.," ii., p. 25 (1829); Meig., "Eur. Schmett.," ii., p. 34 (1830); Bsdv., "Icones," i., p. 60, pl. xiv., figs. 7, 8 (1832); Dup., "Pap. Fr.," suppl. i., p. 57, pl. ix., figs. 3, 4 (1832); Treits., "Die Schmett.," x., suppl., pp. 70, 238 (1834); Germ., "Butt. Coll. Vade-mec.," 3rd ed., p. 117 (1835); Freyer, "Neuere Beitr.," iii., p. 62, pl. ccxxxv., fig. 4 (1839); Wood, "Ind. Ent.," p. 9, pl. iii., fig. 74 (1839); Hump. and Westw., "Brit. Butts.," p. 116, pl. xxxvii., figs. 4-6 (1841); Dbldy., "Syn. List.," p. 1 (1850); Stphns., "List.," 1st ed., p. 2 (1850); Hdnr., "Lep. Eur. Cat. Meth.," p. 14 (1851); Westw. and Hew., "Gen. Diur. Lep.," ii., p. 494 (1852); Gerh., "Mon.," p. 15, pl. xxv., figs. 3 a-c (1852); Led., "Verh. zool.-bot. Gesell.," ii., p. 20 (1852); Stphns., "List.," 2nd ed., p. 19 (1856); Lowe, "Proc. Roy. Soc. Edin.," iii., p. 349 (1857); Stn., "Man.," i., p. 62 (1857); Butl., "Cat. Diurn. Lep.," p. 171 (1869). [\*Titus, Fabr., "Ent. Sys.," iii., pt. i., p. 297 (1793); Godt., "Ency. Méth.," ix., p. 668 (1819); Germ., "Butt. Coll. Vade-mec.," p. 62 (1824); Stphns., "Ill. Haust.," i., p. 95 (1828)]. †Idas, Lewin, "Ins. Gt. Brit.," p. 82, pl. xxxix., figs. 1, 2 (1795); Don., "Brit. Ins.," ix., p. 74, pl. cccxxii., fig. 2 (1800); Haw., "Lep. Brit.," p. 46 (1803); Leach, "Edin. Ency.," ix., pt. i., p. 130 (1815); Sam., "Ent. Comp.," p. 242 (1819); Germ., "Butt. Coll.

\* This name never really referred to this species at all, but belongs to a North American *Strymonid*. It was originally described by Fabricius, *Ent. Syst.*, iii., pt. i., p. 297, as follows:—

"H. R. alis integerrimis fuscis immaculatis; posticis subtus ocellatis strigae postica maculari fulva.

Papilio Titus. Jon. fig. pict. 6. Tab. 44, fig. 2.

Habitat in Anglia, Dom. Drury.

The same size as the preceding [*Artaxerxes*, &c.]. All wings fuscous above, without spots. Beneath also fuscous, the upper with a marginal streak of small black and white lines, the lower with a small median line, and a streak of black dots surrounded by white. Towards the margin red spots marked with a black dot."

Haworth (*Brit. Lep.*, p. 47) observes that it had never been found in England, Fabricius having made this statement through erroneous information. Westwood, in his letterpress to Humphreys' *British Butterflies*, &c., p. 117, states that Haworth was well acquainted with Mr. Jones, whose drawing was the authority for the description given by Fabricius, from information supplied by Mr. Drury, in whose collection the specimen existed. Stephens (*Cat. Diurn. Lep.*, p. 191), under the heading *Strymon titus*, says: "The specimen of *P. titus* in the National Collection bears an old label, on which is written 'Titus 130,' evidently a reference to the description by Fabricius. It is quite possible that this is the type from Drury's coll., received through Mr. Milne, as it answers in every particular to the description and has altogether the appearance of a very old specimen; its true habitat appears to be New England." The specimen is still (May, 1912) in the Brit. Mus. coll., and is labelled "Milne coll. from Drury coll., probably the type." Stephens in his *Illustrations* i., p. 5, 1828, and in his first Catalogue, 1850, had given it as a species of *Polyommatus*. Westwood and Hewitson (*Gen. Diurn. Lep.*, ii., p. 494) give it as a *Lycaena*, but refer to *Strymon mopsus* as a synonym. Godart (*Ency. Méth.*, ix., p. 688) also gives it as a species of *Polyommatus*. Duponchel (*Pap. de France*, suppl. i., p. 58, note) observes that it was not found in any collection in Paris, but was reported by Fabricius to occur in Scotland. De Villiers and Guenée (*Tab. Syn.*, p. 20) give it under "*Agestis*," of which they take it to be a casual aberration. They add that Curtis and other British entomologists had assured Lefebvre that it was neither taken in England or Scotland. By modern American authors (Fernald, French, Scudder, &c.) it is always given in its proper place, as *Strymon* (or *Thecla*) *titus*. I should not have introduced the name here but for a note in Tutt's writing, "*titus* is *astrarche*," leaving me, as he often did, to work out its history.—(G. W.)

† Lewin's *idas* much more nearly resembles *argus* (*aegon*) ♀ on the underside, but as he figures this species on the same plate, and says of his *idas*: "This is a common butterfly with us, and to be taken in almost every dry pasture field and in the open parts of woods," and moreover states definitely that his figure of *idas* represents the ♂, there can be no doubt that his *idas* is *medon*. His nomenclature was followed by most English writers before Stephens.



Vade-mec.,” pp. 26, 59 (1824); 3rd ed., p. 116 (1835). **Cramera**, Eschh., “Kotz. Reise Süd-See,” &c., iii., p. 217, pl. x., figs. 26 *a*, *b* (1821). **Artaxerces**, Bsdv., “Eur. Lep. Ind.,” p. 12 (1829); Dup. “Pap. Fr.,” p. 389 (1832); “Cat. Méth.,” p. 32 (1844). **Salmacis**, Stphns. “Ill. Haust.,” iii., p. 235 (1831)\*; Wood, “Ind. Ent.,” p. 9, pl. iii., fig. 73 (1839); Humph. and West., “Brit. Butts.,” p. 115, pl. xxxvii., figs. 1-3 (1841); Stphns., “List,” 1st ed., p. 2 (1850); Westw. and Hew., “Gen. Diurn. Lep.,” ii., p. 494 (1852); Stphns., “List.,” 2nd ed., p. 19 (1856). **Allous**, Hübn., “Eur. Schmett.,” i., pl. cc., figs. 988-992 (1834-1841). **Salmucis**, Gerh., “Mon.,” p. 15, pl. xxv., figs. 4*a-c* (1852). **Nazira**, Moore, “Proc. Zool. Soc. Lond.,” p. 504, pl. xxxi., fig. 4 (1865); p. 246 (1882); Kirby, “Syn. Cat.,” p. 766 (1874); Butl., “Proc. Zool. Soc. Lond.,” p. 368 (1886). (?) **Chinensis**, Murr., “Trans. Ent. Soc. Lond.,” p. 523, pl. x., fig. 5 (1874); Leech, “Butts. China,” ii., p. 315 (1894); Staud., “Cat.,” 3rd ed., p. 83 (1901). (?) **Mand-schurica**, Staud., “Rom. Mém. Lép.,” vi., p. 161 (1892); Rühl, “Pal. Gr.-Schmett.,” p. 262 (1893). (?) **Myrmecias**, Chrsthph., “Hor. Soc. Ent. Ross.,” xii., p. 235, pl. v., fig. 7 (1877); Rühl, “Pal. Gr. Schmett.,” p. 248 (1893); Staud., “Cat.,” 3rd ed., p. 83 (1901).

ORIGINAL DESCRIPTION.—Entirely brown above, below very like *Argus* No. xxix. In flowery fields. July. Third magnitude, and the smallest of all. Scarce (Hüfnagel).

Many entomological writers have hesitated to accept this description, but, although meagre, there is no other species to which it can be referred. Hüfnagel was writing short descriptions of the Lepidoptera which he had found in the neighbourhood of Berlin, and it must be remembered that his “*Argus* No. xxix.” is *icarus*. He divides all the butterflies he mentions into three magnitudes, and states that this is the smallest among them all. This statement confines the possible species to that now under consideration, *Cupido minimus* and *Plebeius argus* (*aegon*), and the colour mentioned at once eliminates *minimus*. The ♀ *P. argus* is generally brown above, but the underside with its white band and metallic spots would not strike an observer as being “very like” *icarus*, whereas that description would apply much more nearly to the present species. The date of capture is also correct for the neighbourhood of Berlin, and while the habitat mentioned suits the present species, it would not be generally applicable to *P. argus*. Hüfnagel, moreover, gives no hint that he is describing a ♀, and hence implies that both sexes are brown, for he was aware of the difference in colour between the two sexes of *icarus*. There seems, therefore, to be no reasonable doubt that those of the earlier entomologists who applied the name *medon*, Hüfn., to the present species were correct. Courvoisier (*Ent. Zeits.*, xxiv., p. 112), while accepting the name *medon*, refers it to Esper, thus following Borkhausen and some other writers. Staudinger’s acceptance of Hüfnagel’s name in his first Catalogue (1861) was doubtless the cause of its general use during the following decade, whilst his very unnecessary abandonment of the name in his 2nd edition (1871) was, probably, equally responsible for the common recrudescence of “*astrarche*” in later times. Oberthür (*Études de Lép. Comp.*,” iv., p. 244) gives ample reason for the precedence of *agestis* over the latter name, the fact that Ochsenheimer had seen Schiffermüller’s collection, and recognized the species from the actual insect, being decisive,

\* The date given in Stephens’ vol. iii. is 1829; Wailes, however, who had every opportunity of knowing, asserts that it was published in May, 1831, and that the description was from specimens supplied by him to Stephens in that year, though of course captured previously.—(G. W.)

although Schiffermüller had erroneously supposed the ♂, with which he was not acquainted, to be blue. Bingham's observation (*Fr. Ind.*, ii., p. 337) that Hüfnagel's description is insufficient is perhaps correct if the words are taken by themselves, but we hold that there can be no question on other grounds as to what species he intended. The earliest figure of this insect appears to be that of Petiver in 1702.

IMAGO.—22 mm.-34 mm. Both sexes of a rich dark brown tint on the upperside, with a marginal row of orange-red spots more or less developed on all the wings and a black central discoidal spot on the forewings; underside ochreous grey, forewing without basal spots, discoidal spot and submedian row of 7 spots black, ringed with white, marginal band of orange-red spots, frequently coalescent, edged interiorly with a dark shade and exteriorly with white containing black spots; hindwing with 4 basal and a row of 7 submedian black spots ringed with white, a discoidal black spot irregularly surrounded with white of a more or less triangular form, and a marginal band of orange-red, slightly lunular, spots, followed towards the border by a row of black dots set in white; a white central wedge-shaped streak running from the orange-red band to the discoidal spot. Fringes white with dark transverse markings.

SEXUAL DIMORPHISM.—This is slight in comparison with most of the *Lycænids*, the ground colour of the two sexes being the same; the ♂, however, has generally less orange-red than the ♀ in the same locality, though the most strongly marked ♂s have much more than the least marked ♀s; on the underside the ♀s have generally a browner, often a much browner, tint than the ♂s, which are more inclined to grey. Pierce makes the following observations on the scaling of *A. medon*:—♂, No androconial scales and no transparent scales. The dark scales, .004 in. × .001 in., are typical parallel scales with 3 and 4 points; underside similar, 4 points, deeply indented. ♀, .005 in. × .0013 in., similar, 4-pointed; underside similar, 5-pointed. In the var. *artaxerxes* the white spot is composed of a few 3-lobed, rounded scales. So far authorities have agreed that, where the male "blue" is brown, there are no androconial scales. I believe this is so in *medon*. In hunting for these scales I came across a small patch of curious asymmetrical scales on the inner margin, at the extreme base of the underside of the forewings; the striations run obliquely from left to right, downwards, on both sides; *i.e.*, both sides are similar, with the result that, viewed through the scale, they form a diamond lattice-work. At first I thought I had found the missing androconials, but further examination revealed the fact that these scales are evidently peculiar to the Blues and are found on both sexes. (Pierce.)

GYNANDROMORPHS.—We have found no record of any gynandromorph in this species. Considering how many have been recorded in other species of this tribe, it seems probable that the cause is not so much their non-existence, as the fact that the close resemblance between the sexes has caused them to be overlooked.

PATHOLOGICAL SPECIMENS.—Harrison mentions (*Ent. Rec.*, xviii., p. 237) a specimen taken July 21st, 1906, which "has the right hindwing of a silvery colour as in *Rumicia phlaeas* ab. *schmidtii*, but the red spots are normal, and form a strange contrast to the white ground." Possibly another that he mentions (*loc. cit.*), with "the



forewings powdered with coppery scales," may belong to this category. Holmes also reports a ♀ of var. *salmacis*, from the Kendal district, with the orange spots on the right side much lighter than those on the left.\*

VARIATION.—Grum-Grshimailo says (*Rom. Mem. Lep.*, iv., p. 393) that "amongst the *Lycaenids* there is no single species which varies so much as this. Every corner has a form of *astrarche* which belongs to it." This statement, we must confess, appears to us to be in wild exaggeration of the facts. It is true that within very narrow limits the variation of *A. medon* exhibits a considerable number of forms, a few of which are very striking, but there is nothing approaching the same scope for variation as is possessed by species of dimorphic sexual colouring, such as *Polyommatus icarus*, or the two British species of *Agriades*, and the invariable absence of basal spots from the underside forewing deprives this species of a fruitful source of minor aberration, of which *P. icarus* and *A. coridon*, at any rate, seem to take the fullest advantage. Again, the striated, and, except in the north of England, the obsolete, forms are few and scarce, and the colour-variation in the ground of the upperside is, comparatively speaking, very slight. So far, again, from every corner having its own special form, purely local races can hardly be said to exist, apart from var. *artaxerxes* and (if it be a form of *medon* at all) var. *chinensis*, though, to some extent, *nazira*, *salmacis*, *sarmatis*, *montana*, and *cramera* are specially identified with particular districts. Courvoisier, indeed, goes so far as to assert (*Ent. Zeits.*, xxiv., p. 126) that neither the amount of red spots nor the colour of the underside (the two principal points in which variation takes place) has any strong connection with sex, or brood, or locality, nor have these points any special connection with each other. This statement is based on some 200 specimens, and our own observations, based on probably ten times as many, bear out his view to a considerable extent, though it certainly requires modification. Indeed, he himself implies that it is rather the number of exceptions than the absence of any general resemblance among the specimens of any given locality that causes him to write to this effect. If, however, the range of variation is comparatively small, it is very fully occupied. The ground-colour of the upperside may be of any shade from a deep black-brown to a brightish burnt-sienna, while that of the underside is to be found varying from almost pure white to a rich coffee-colour, passing through every intermediate shade of ochreous-grey on the one hand, and of yellow-brown and *café-au-lait* on the other. The spotting of the upperside may vary in amount from complete absence (*sarmatis*, Gr., and *allous*, Hb.) to a broad, unbroken, antemarginal band (*cramera*, Eschh.), and in colour from the most brilliant orange-red (*calida*, Bell., etc.) to pale yellow (*pallidior*, Obth.), or even white (*graeppii*, ver Huell); while the usually black discoidal spot may be ringed with white (*albiannulata*, Harr.), or even become entirely white (*artaxerxes*, Fabr.) on the forewings, and sometimes on the hindwings as well. Between the bright antemarginal band and the edge of the hindwings may appear a row of black spots in every degree of dis-

\* I have a Swiss specimen in which the outer half of the left forewing is lighter than the rest of the ground-colour, and the spots at the border of the wing dull yellow, whilst those on the other three wings are normal.—(G. W.)

tinctness or obsolescence, and these may also occur, though much less frequently, on the forewing as well, on which, however, they are often visible with a lens; occasionally also a slight, but very distinct, outer edging of white may be found beyond these black spots on the hindwing (*ab. albisignata*, n. ab.). On the underside, in addition to the wide variations of ground-colour already mentioned, the markings also exhibit a very considerable range of difference. The conspicuous light wedge-shaped mark on the hindwing, which is often broad, and in strong contrast with the ground-colour, may be narrowed to a fine line, or even disappear altogether; the black pupils of the eyespots may be greatly reduced in size (*salmacis*), or be entirely wanting (*artaxerxes*); the orange appears either in separate, more or less lunular, spots, or the spots may be coalescent, until at last the effect produced is that of a broad, unbroken band, which looks as if it had been smeared on with a paint-brush. The colour of the orange, also, even without taking into consideration the extreme case of *ab. pallidior*, varies normally from a deep red-orange to a lightish orange-yellow. Cases of obsolescence of the eye-spots, though scarcer than in many other species of the tribe, are nevertheless sometimes very complete, and in the north of England are far from rare, though few have been reported from other localities; the partial disappearance of the discal row on the forewings, both at the costa and on the inner margin, is, on the other hand, extremely common. The full row consists of seven spots, that nearest to the inner margin being a double one, this being sometimes divided into two separate spots, would, if the costal spot were present in the same examples, give the appearance of eight separate spots. The costal spot is, however, rarely present, though Hodgson considers that it is commoner than in any other British Plebeiid except *P. argus*, and where it is so the double spot has a tendency to complete coalescence, which often takes place even in the absence of the costal spot. The latter, when present at all, sometimes appears on one side only. The geminated spot towards the inner margin is often either single or altogether absent, leaving a row of five spots only; this may also be the case on one wing only, as may be seen from the following note given by Warren (*in litt.*) of a series of the 2nd brood, consisting of 16 ♂s and 7 ♀s, taken by him at one time on the Chiltern Hills, the costal spot being in all cases absent.

♂ : geminated spot	present, .. .. .	5
single "	entirely absent, .. .. .	7
double "	present, .. .. .	3
double "	on right wing, none on left, ..	1 = 16 ♂
♀ : geminated	present, .. .. .	1
single "	entirely absent, .. .. .	2
single "	present, .. .. .	2
double	on left wing, single on right, ..	2 = 7 ♀
Total		<u>23</u>

Reverdin gives (*in litt.*) a similar note, making a distinction between the specimens from the mountains and the plain, but not between the sexes:—

Plain :	germinated spot present,	..	..	6	
	single " " entirely absent,	..	..	7	
Mountain :	germinated " present,	..	..	6	= 19
	single " " entirely absent,	..	..	16	
	single " " present,	..	..	27	
				36	= 79
				Total	98

Only one specimen out of this number possesses the costal spot, *viz.*, one of the mountain examples in which the germinated spot is present, thus, apparently, affording an instance of the presence of all the possible 8 spots, but nothing is said as to the coalescence or otherwise of the germinated spot; in the form of the plains it is stated that the spots below the "normal" five are small and close together, in the mountain form it is merely said that the spot, when single, is very small, and that in other cases it is double.

The size of these spots also varies greatly, though their usual tendency is towards being large for the size of the insect; a slight tendency towards special enlargement is also occasionally to be observed in the three spots above the germinated one, especially in the lowest of the three. The white edging of the two upper of the same three spots is usually somewhat lengthened out towards the orange band, and in some cases presents almost a wedge-shaped streak, analogous with that usually present on the hindwing. In the sub-median row of spots in the hindwing there is a great and very remarkable variation in the position of the two costal spots. The upper one, which normally stands about half as far from the orange band as from the costal spot of the basal row, is occasionally pushed so far towards the latter that the proportion of the distances is exactly reversed, the second spot of the row being then considerably exterior to it and widely separated from it (*ab. separata*, n. ab.); in other cases, where the costal spot occupies its regular position, the second spot, which is normally slightly exterior to it, may either be immediately below it (*ab. directa*, n. ab.), or somewhat, often considerably, interior to it (*ab. intrusa*, n. ab.), making a wide break between this and the rest of the series. Neither of these two latter forms are unusual, and both seem independent of sex, season and locality. In this matter also the two wings often differ somewhat, though rarely to any great extent. Occasionally, even when there is no other appearance of obsolescence, one of the spots is absorbed by the light wedge. The size of this row of spots also varies, but they are generally considerably smaller than those on the forewing. The four basal spots are usually in a straight line, though the third is occasionally placed rather more towards the base, and the fourth either nearer to the base or to the anal angle; the third, and more rarely the fourth, is sometimes absent. On the other hand, there is sometimes an extra spot on the inner margin between the fourth and the base of the wing. As in other related species, striated specimens exist, but they are very scarce; the occurrence of one or two spots on either wing showing some tendency to elongation is, on the other hand, far from rare; the spots on the forewing most usually affected are those immediately above the germinated spot, or the uppermost of all, excluding the rare costal spot; on the hindwing it may occur in any spot of the sub-median

row except the costal. Hodgson observes that the species tends distinctly to the ab. *discreta*, though the ab. *glomerata* is by no means uncommon. A characteristic grouping of the spots on the forewing assumes a racquet-shape, or, in the case of absence of the geminated spot, a fairly good circle.

It is difficult to formulate any rule as to variation in size. Speaking generally it may be said that the tendency is to become smaller in higher latitudes and altitudes, and that, where the species is double-brooded, the first brood is generally somewhat larger than the second. But the exceptions are numerous. The largest specimen in the Brit. Mus. coll., for instance, comes from Amurland, and measures 38mm., another from the same district measures 34mm.; there is also a specimen from Sweden that measures 35 mm. In these localities the species is doubtless single-brooded. On the other hand, there is a specimen from Hyères, dated March 30th, 1898, which is only just over 22mm., and another from Messina, from the Zeller coll., which is but 23mm. Those from the Greek Islands, again, are very small, as are those from Cyprus and Crete, but these having been taken in September, it is probable that there may even be three broods in these latter localities, as is certainly the case in Greece both on the mainland and in the islands. Bellier's types of var. *calida* from Corsica are also small, as is usually the case with var. *ornata* from Algeria, i.e., about 24mm., yet a specimen from Morocco in the Brit. Mus. coll. is no less than 36mm., as is also a specimen from the Pyrenees (Gavarnie) these being the largest in the collection except the Amurland example already mentioned. The dark race from Sary Ob, in Sarafschan (Turkestan), though taken at an altitude of 7,000 to 9,000ft., all measure about 30mm. Specimens of var. *nazira* from the Himalayas average slightly larger than British examples, measuring from 24mm. to 32mm. The specimens of var. *sarmatis* from S.E. Russia are a somewhat large race and all measure about 32mm., being of about the same average size as var. *gallica* from Brittany, and slightly smaller than the Bosnian race which measures about 33mm. The Greek specimens (Morea, v., 1900, Athens, 11, v., 1900, Parnassus 22, v., 1900) though the locality is further south, measure only from 26-28mm. The most southern race of all, var. *cramera*, from the Canary Islands, is not large, but varies considerably in size, the ♂s in the Brit. Mus. coll. ranging from 24mm. to 30mm., and the ♀s from 27mm. to slightly less than the largest ♂.

The range of variation is greater in Britain than in any other area of the same size. Normally, the orange border is bright and full on all the wings in the south, and, advancing northwards, becomes narrower, especially on the forewing, and less bright; gradually it disappears from the forewing altogether, and becomes slight on the hindwing, especially in the ♂. Examples of ab. *allous*, in which the orange is entirely absent from all the wings, occur occasionally in Lancashire, Westmoreland and Scotland. At the same time the pupils of the spots on the underside tend to diminish in size, and across the Scotch border have generally disappeared. A few white scales are often to be found round the black discoidal spot on the upper side of the forewing, and these also occur elsewhere than in England, e.g., in some specimens of var. *gallica*, Obth., from Brittany; they

increase, however, in number and in frequency of occurrence towards the north, the black spot being eventually replaced by a white one, sometimes on all four wings. But although this is the general line of variation, there are many exceptions. Wailes observes that "there is no doubt that this band of orange spots is generally most fully developed in the southern localities; but the supposition that it always decreases as we proceed north is certainly erroneous; for some of the finest and most brilliant specimens in this particular that I have seen are from parts as far north as Liverpool, from our own district [Durham], and from Edinburgh; those from the two latter localities bearing the white spot of *artaxerxes*." This white spot, again, is not confined entirely to the north, still less to specimens which are of the *artaxerxes* form beneath. It has been observed, among other localities, as far south as Dartmoor (Leach) and Brighton (Cooke), and from Richmond (Yorks) northward it is by no means uncommon, even where the *artaxerxes* underside is extremely scarce, if present at all. The variation in the Durham forms of this species, which may be regarded as aberrations of the var. *salmacis*, is very wide, wider, indeed, than in any other portion of its habitat, and has been closely worked out and described by Harrison (*Ent. Record*, xvii., pp. 267, 280; xviii., p. 236); an account of these different forms will be found under vars. *salmacis* and *artaxerxes* and their aberrations. The amount of white varies from a few scales to a complete circle when the discoidal spot is black, and in the case of a white discoidal the size ranges from a small dot to 2.5mm. in a specimen taken by Harrison.

Hodgson, who made a special study of the variation of the *Lycenids* in Great Britain, has contributed (*in litt.*) a number of additional observations on this species. He states that he has found no difference between the specimens taken on chalk and those on sandy soils after long and careful comparison. The variation of the fringes he describes thus:—"Never pure white; often with dividing line parallel to margin; often, especially on the forewing, dusky, sometimes nearly, or wholly, brownish, otherwise with striæ running out from the nervures through the fringe." With regard to the white edging exterior to the marginal black spots, he observes that it occurs not uncommonly and in both sexes, though more rarely in the ♂, occasionally, though very rarely, on all the wings, but usually only on the hindwing and at the anal angle of the forewing; he adds that there is no tendency to encroach inwards. He also notes the occasional, but very rare, absence of the discoidal spot on the upperside of the forewing, and the fact that the nervures, or the border, or both, may be darker than the rest of the wing, the dark nervures being commoner in the north, the dark border in the south. The greater brilliancy of the orange markings he holds to be coincident with hotter seasons, independent of broods. On the underside he observes that the white marginal band is occasionally increased in breadth at the expense of the orange, and that the black spots contained in it are often small, or nearly, or quite, absent, but more commonly in the north than in the south. He also remarks on the occasional presence, in the south, of white, or whitish, wedge-shaped marks at the points where the basal spots of the forewing occur in other species, and adds that he has one specimen captured in Sussex, in 1889, in which one minute

basal spot appears in each forewing. He observes that in the north there is generally a brown tint in the ground colour of the undersides, the pearly grey being almost confined to the south. The general variation in size is not great, though occasionally both large and small specimens are found. The usual range is from 22mm. to 30mm., but Briggs records specimens from Folkestone of only 15mm. in expanse; these, however, are probably measured from tip to tip of the forewings, which would give an expanse of about 18mm. if measured from the centre of the thorax to the tip of each wing, which would still be very small. On the other hand ♀s up to 32mm. are far from rare.

The examples of Northern Europe do not, as a rule, display more than a slight amount of orange, and the *allous* form is by no means unusual; the orange is generally in separate lunules on the hindwings, and separate spots on the forewings when it occurs on these; it is not, however, deficient in brilliancy. A specimen is noted by Sparre Schneider from Christiania with the black discoidal spot of the forewing surrounded by white. There is great variation in size. The prevailing form in Germany is that of central England, with more orange-red than Hübner's illustration which he calls *agestis*, but less than Bergsträssers *astrarche* in the ♂, though the ♀, the sex he illustrates, is generally of a form corresponding with his figure. In the Brit. Mus. coll. is a specimen of *ab. albiannulata* from Berlin. The form without orange spots is also to be found in North Germany, and is, in fact, Hüfnagel's type.

In Switzerland the variation is not so extensive as would naturally be expected, considering the different altitudes at which the species is to be found. The first brood, even in the plains, rarely shows any orange-red on the forewing in the ♂, being typically of the *semi-allous* form, and sometimes of the *allous* form, entirely without spots, which is, however, less scarce in the mountains. The second brood in the Rhone Valley often approaches var. *aestiva*, especially in the colouring of the underside, but the orange of the upperside spotting is not very vivid, much less so than in many British specimens. The upperside ground-colour is, in the mountains, and in the first brood in the plains, generally speaking, very dark, and the specimens being mostly small, are of the *alpina* form. The underside ground-colour is generally grey, but often of a somewhat darker shade than is usual in England; it is very rarely that the ♂s show the slightest tinge of brown, except, as stated above, in the second brood of the hot Rhone Valley. The mountain specimens, for instance those taken in July on the Albula Pass, are practically indistinguishable from the June specimens from Bex or Vernayaz, though the average of the former may be slightly smaller. Specimens taken in July, at 4,000 to 5,000ft., often show more orange spotting, and a brown tinge in the ground-colour of the underside in the ♀s.

In the more mountainous parts of France there is not more orange-red than in the last-mentioned Swiss examples, but Oberthür observes that in the plains the wings are adorned on the upperside with a strongly accentuated border of interneural spots of a vivid orange-red (his var. *gallica*); on the underside the ground-colour varies from whitish grey to brown. The marginal black spots on the hindwing often show on the upperside.

In Spain the variation is considerable. The special form of the Southern mountains, the Sierra Nevada and the Sierra d'Alfakar, named var. *montana* by Rühl and var. *nevadensis* by Oberthür, with its large size, slight orange markings and peculiar pinky-cream underside, occurs in both broods, but, in the Sierra d'Alfakar at any rate, the var. *calida* is also found in the second brood. Elsewhere in southern Spain, and as far as Granada, the first brood is generally of the *ornata* and the second of the *calida* form. Mrs. Nicholl's specimens, taken at 5,000ft. on the Picos de Europa, in June and July, are small and have very little red spotting on the borders of the upperside.

In Italy several surprises are met with, especially in the islands. The specimens vary greatly both in size and markings. Wheeler remarks (*in litt.*) on the difference in size of specimens taken on the same day at 4,000ft. in the Abruzzi, and on the great difference both in this respect and in marking between the ♂s and ♀s. The former are sometimes more than half as large again as the latter, and even in other localities in the Apennines, where the difference is not so great, the ♀s are generally distinctly smaller; the ♂s also have but narrow red lunules on the hindwings, and very little more than traces on the forewings, in localities such as Palena (4,000ft.), where the ♀s are often of the *calida* form, and always well provided with red to the costa of both wings. On the other hand a ♀ from Florence, in the Brit. Mus. coll., is of large size but with not more orange-red than is usual in the south of England. Zeller's specimens from Messina, taken July 15th, 1844, are not only very small, but have very narrow orange bands, failing towards the costa; those from Syracuse, May 17th, and Catania, June 26th of the same year, are larger but with no more red in proportion. On the other hand some of the Sicilian specimens are of the most pronounced *calida* form, and, like some of the ♀s from Sardinia, approach very closely to var. *cramera*. Whilst Corsica is the home of Bellier's ab. *calida*, it must not be forgotten that he speaks of it not as a local race but as a "variety" of frequent occurrence in the summer brood.

The most striking form is found in the Canary Islands (var. *cramera*, Eschh.), and has a broad, generally denticulated, deep orange-red band on all the wings, and a bright red-brown underside, varying in depth of tint.

In Algeria and Morocco the specimens in the Brit. Mus. coll. and others which we have seen appear to indicate var. *ornata* (El Kantara, May 8th, Lambessa, May 11th, Constantin, May 15th, 1882) for the first brood and var. *calida* (Meduna, May 29th, Marrakesh, June 6th, Immentella, July 8th, 1901) for the summer brood; Staudinger, however, says (*Iris*, v., p. 280) that some of his specimens from these localities "hardly differ from the usual form," and are therefore probably to be attributed to the var. *gallica*. In North-East Africa (Egypt and Cyrenaica), the species, according to Graves, appears not to occur.

In Bosnia and Bulgaria the specimens are large and show very little red on the upperside, in some cases only slight traces. With regard to the neighbourhood of Constantinople, Graves writes (*in litt.*) as follows:—"Specimens taken in spring agree with Oberthür's description of var. *gallica*, in having the submarginal spots orange-red on the upperside of both wings well marked, sometimes, in the male, reaching the costal



margin of the forewings. I should put them down as var. *gallica*, the underside ground-colour being greyish, and the upperside orange-red spots being, on the average, not quite so well developed as in the Syrian specimens, though I must admit that the difference is slight. In the later brood, or broods, these spots are not more developed than in the first brood. The ground-colour of the underside of the wings varies from a slightly more yellowish-grey than in the spring specimens (Erenkeui, 10, vi., 1911, Belgrad Forest, 16, vi., 1911), through various shades, to a rich and warm shade every whit as bright as in my brightest Syrian specimens. My largest *medon* from near Constantinople is 32.5mm., a male. I find the average size of the spring specimens less than that of the later broods. With regard to the dates of appearance, etc., here given, I may note that 1911 was a very late year at Constantinople. Warm weather, save for a brief spell in the first week of April, could not be said to have begun till May 2nd."

Grund notes that in Dalmatia var. *ornata* occurs as the spring brood, and var. *calida* as that of the summer. Aigner-Abafi reports the same forms from Hungary, but adds that in summer var. *aestiva* is more usual.

Staudinger notes the Greek specimens from Naxos, Attica and Parnassus as having, both in the early spring (March and April) and early summer (May and June) full bands of orange-red spots reaching, or almost reaching the costa, the first brood being invariably light grey beneath and the second brown, deep brown in the ♀s, the former being of the form which he afterwards called var. *ornata*, and the latter the original examples of his var. *aestiva*.

The specimens from Asia Minor (Broussa, Amasia), show much the same variation. The underside of the spring brood, however, is of an exaggerated form of var. *ornata*, being so white as almost to equal ab. *albicans*, Auriv., in this respect; they differ from this form on the upperside in the pronounced orange-red band on both wings; the brown tint of the underside in the second brood is also deeper than in the Greek specimens, and differs very little in the two sexes. On the upperside they have a slightly broader orange-red border, but should, perhaps, rather be reckoned as var. *aestiva* than var. *calida*.

We have no data as to the first brood in Syria, but Graves observes (*in litt.*) that "the summer and autumn specimens are of a bright ground-colour on the underside," which he describes as "a warm brownish or greyish-yellow, sometimes approaching orange." He adds: "the band of orange-red submarginal spots on the upperside of both wings is well developed, especially in the ♀. In most of my ♂ specimens it reaches the costal margin of the forewings, though the spot nearest the margin is often obscure." On the underside forewing the costal spot of the discal row is often present. At Damascus specimens are taken in September with a duller, greyer ground-colour on the underside, especially on the forewings; the September specimens from Aleih, 2,500ft., are, on the other hand, particularly bright, both in the ground-colour of the underside and in the orange band of the upperside.

Persian specimens in the Brit. Mus. coll. from Urumiah and Orchabad have a good deal of orange on the upperside; those from



Teheran, on the contrary, are of the south-west Himalayan form, var. *nazira*, Moore; these have very narrow, rather dull orange bands on both wings, failing before the costa, the underside being of pale *café-au-lait*. Though the amount and the brightness of the orange varies, it is only within narrow limits. The dark spots between the orange and the edge of the wings is very conspicuous in this form.

Specimens from Turkestan show a good deal of orange, especially on the hindwing, and amongst these are the most pronounced specimens of ab. *albisignata*. All those in the Brit. Mus. coll. except a ♀ taken by Haberhauer at Samarkand are very pale on the underside. Most of the more northern Asiatic specimens, at least from mountain districts, show little or no orange, few as much as in Hübner's figure of "*agestis*"; though a ♂ from Beshkana, 3,500ft., has more. A very large ♂ from Amurland, and 2 ♂s and a ♀ from Ongodai (Altai mtns., 3,500ft.), taken July 10th, 1898, are of the *allous* form; others from these localities, and specimens from Arasan (6000ft.), from the Changai mountains, and a pair from Irkutsk approach the same form; the underside of the ♂s is grey, that of the ♀s slightly browner. The spotless examples from Sary Ob, Sarafschan, are pale beneath and belong to the var. *sarmatis*. Two smaller specimens from Dschungaria, taken June 11th and 19th, 1889, have a little orange-red on the hindwing and traces on the forewing.

The var. *chinensis*, Murray (*mandschurica*, Stdgr.), of which var. *myrmecias* is only a smaller form, may belong here. Certainly not one of the points adduced by Staudinger (who originally regarded it as a form of this species) for separating it can be relied upon. The fringes are not at all more chequered than those of the var. *cramera*, nor than some specimens of var. *ornata* or var. *calida*, all of which have as broad or broader orange submarginal band. The white underside on which he relies is scarcely, if at all, whiter than in specimens from Asia Minor, while the absence of the white wedge-shaped streak on the underside of the hindwing is not only common in var. *calida*, and found even in British specimens, but is absolutely accounted for by the general whiteness of the ground-colour. This is the most north-easterly form of the species and occurs commonly in June and July to the north of Pekin, but it is also found in Dschungaria, and in the smaller form of var. *myrmecias* in the Karamouk and Tekke districts, and on the east coast of the Caspian. This is, indeed, the strongest argument against its identity with *A. medon*, considering the small amount of orange usually found in specimens from some of these districts, but we have as yet no evidence to show that it is not merely the form of the lower levels.\*

#### BRITISH RACES.

By far the most interesting of the local races of this species, and, indeed, almost the only forms to which the title can be justly applied,

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\* As the position of this form is doubtful, and the figures give rather the impression of a Scolitantid species, (which the actual insects do not), it is only right to state that I am alone responsible for its inclusion here; I have however the support of Oberthür and Blachier, who both include it without question among the forms of this species (G. WHEELER).

are those which are peculiar to the northern portion of the British Isles, *viz.*, *salmacis* which occurs in the north of England, and particularly on the coast of the County of Durham, and *artaxerxes*, which is the usual form over the Scotch border; the latter being both the more distinct, and the more conspicuous. Both races, but especially *salmacis*, exhibit several aberrations, a number of those of the latter race being of more or less frequent occurrence.

For many years after *artaxerxes* was described by Fabricius, in 1793, it was regarded as unquestionably a distinct species, both by British and foreign entomologists; Lewin, Haworth, Donovan, Leach, Miss Jermyn, Samouelle, Stephens, Wood, Westwood, Doubleday and Stainton among the former, and Godart, Meigen, Boisduval, Treitschke, Freyer, Heydenreich, Gerhard and Lederer among the latter, all treat it as such, though, in the time of the later writers mentioned above, the controversy on the subject, which had been carried on in a desultory way for some time, was about to reach an acute stage. In 1831 Stephens considered that he had detected a third species among the Durham examples sent to him by Wailes, which he described in the 3rd vol. of his *Illustrations*, and named *salmacis*. This, however, being intermediate between the *medon* of the south and the *artaxerxes* of Scotland, proved to be the link through which the identity of the three so-called species was eventually determined.

The first suggestion of this identity was due to Edward Newman, who wrote in 1834, in the *Entomological Magazine*, vol. ii., p. 575, as follows:—

“From examining specimens of *Polyommatus agestis* from different localities, I have arrived at a conclusion which will not, I fear, be coincided with by many of our Lepidopterists. On the South Downs of Sussex and Kent, *agestis* assumes what may be called its typical form. I have taken it at Ramsgate, Dover, Hythe, Hastings, Rye, Brighton, Worthing, Little Hampton, Chichester, Portsmouth, Isle of Wight, Dorsetshire, Somersetshire; and throughout this range it is very similar: then, going upwards, I have met with it at Worcester, Birmingham, Shrewsbury; and here an evident change has taken place, the band of rust-coloured spots has become less bright; at Manchester these spots have left the upperwing almost entirely; at Castle Eden Dean they are scarcely to be traced, and a black spot in the centre of the upperwing becomes fringed with white; the butterfly then changes its name to *salmacis*. We proceed further northwards, and the black pupil leaves the eyes on the underside, until at Edinburgh they are quite gone; it is then called *artaxerxes*. The conclusion I arrive at is this, that *agestis*, *salmacis*, and *artaxerxes* are but one species.”

The point thus raised did not, at the time, lead to any great amount of controversy, nor, indeed, to anything more than a few passing surmises, and entomologists seem to have been satisfied that *medon* and *artaxerxes*, at any rate, were separate species until the discovery by Professor Zeller that the larvæ were indistinguishable. The usual food-plant of *medon* being *Erodium cicutarium* while that of *artaxerxes* was found to be *Helianthemum vulgare*, caused Dr. Lowe to lay it down, in a paper read in 1857 before the Royal Society of Edinburgh, as practically settled, that the two were distinct species, while he regarded *salmacis* as a variety of *medon*, rather than of

*artaxerxes*, an opinion contrary to that usually held by those entomologists who considered the other two forms as distinct species. A request in the *Zoologist* for 1858, p. 600, from Logan for larvæ of "*agestis*," coupled with an expression of opinion in favour of the identity of the species, provoked a discussion in the same magazine, in which Logan's view was backed by Newman, Harper-Crewe, and Wailes, whilst the other side was upheld by Harding with considerable bitterness but very small logic. A magnificent résumé of the question was published in the same year by Wailes in his *Catalogue of the Lepidoptera of Northumberland and Durham*, pp. 24-35, in which practically everything that had been written on the subject was reviewed, and from that time the specific identity of the three forms was generally allowed, the discovery that *medon* would also feed on *Helianthemum*, and *artaxerxes* on *Erodium*, giving an additional reason for this view. It was not, however, till 1877 that the case was absolutely proved by Buckler who writes (*Ent. Mo. Mag.* xv., p. 241, April, 1879) as follows: "On June 3rd, 1877, Mr. J. E. Robson, of Hartlepool, while searching *Helianthemum vulgare* growing near the coast in his locality, found five larvæ of a *Lycaena*, and at once very kindly forwarded them to me; on comparing them with the figures I had taken of larvæ of *artaxerxes* in 1868, I found them to be in every respect precisely alike. These larvæ soon fed upon *Helianthemum*, protected by a glass cylinder, and they duly changed to pupæ; two of them were unfortunately attacked with mould, but the other three disclosed three differently marked butterflies, viz., on July 2nd, 5th, and 7th. These appeared to be respectively *salmacis*, *artaxerxes*, and *agestis* above, but to partake most of *salmacis* beneath."\*

We will now proceed to deal with these varieties and their aberrations in detail.

Var. *artaxerxes*, Fabr., "*Ent. Sys.*," iii., pt. 1, p. 297 (1793)†; Wailes, "*Cat. Lep. Northd. Durh.*," p. 24 (1858); Staud., "*Cat.*," 1st ed., p. 5 (1861); Zell., "*Ent. Mo. Mag.*," iv., p. 77 (1867); Newm., "*Brit. Butts.*," p. 127, fig. 3† on p. 123 (1871); Kirby, "*Syn. Cat.*," p. 364 (1871); Staud., "*Cat.*," 2nd ed., p. 11 (1871); Kirby, "*Eur. Butts.*," p. 50 (1879); Lang, "*Butts. Eur.*," p. 115, pl. xxiv., fig. 10 (1884); Kane, "*Eur. Butts.*," p. 41 (1885); Buckl., *Larvæ*, i., p. 121, pl. xvi., figs. 1, 1b-g (1886); Auriv., "*Nord. Fjär.*," p. 13, (1888); Dale, "*Hist. Brit. Butts.*," p. 74 (1890); Barr., "*Lep. Brit. Isl.*," i., p. 74, pl. x., figs. 3c-f (1893); Rühl., "*Pal. Gr.-Schmett.*," pp. 261 (1893), 759 (1895); Meyr., "*Hndbk.*," p. 346 (1895); Tutt, "*Brit. Butts.*," p. 180 (1896); Kirby, "*Hndbk.*," ii., p. 102, pl. xlviii., figs. 6, 7 (1896); Staud., "*Cat.*," 3rd ed., p. 83 (1901); Lamb., "*Pap. Belg.*," p. 229 (1902); Spuler, "*Schmett. Eur.*," p. 63 (1902); Tutt, "*Ent. Rec.*," xiv., p. 114 (1902); Harr., "*Ent. Rec.*," xvii., p. 280, (1905); xviii., p. 236 (1906); South, "*Brit. Butts.*," p. 161, pl. cv., figs. 15-17 (1906); Reb., "*Berge's Schmett.*," 9th ed., p. 68 (1907); Seitz, "*Gr.-Schmett.*," i., p. 309, pl. lxxx., a (1909). *Artaxerces* Obth., "*Et.*," xx., p. 25 (1896); "*Feuille Jeunes Nat.*," 4th ser., i., p. 17, pl. ii., fig. 19 (1900); "*Lep. Comp.*," iv., p. 250 (1910).—*Hesperia ruralis* alis integerrimis nigris, anticis puncto medio albo, posticis lunulis rufis, subtus margine albo rufo punctato. Habitat in Anglia (Fabricius).

Fabricius adds that, beneath, all the wings are grey with white hindmargin and a row of red spots, the forewings also with a white median and the hindwings with many white spots.

\* This passage also occurs in Buckler's *Larvæ*, vol. i., but this work was not published till some nine years later.

† For other records see Synonymy of species, under *Artaxerxes*, *Artaxerces*, pp. 228, 230.

‡ This is of the form *quadripuncta*, Tutt, with a white spot on each wing.

The species (as it was considered) was for a long time regarded as being extremely scarce, and Donovan states in 1813 that there was only one other cabinet in London in which it was not represented by a paper representation. This, by the way, was regarded as a deception and a very "low-down" proceeding. Perhaps the drawings were cut out, and pinned so as to look like real insects, otherwise the entomologists of the time seem to have been as hypercritical as the literary lights of a previous generation over Chatterton's "forgeries." Soon after the publication of Donovan's work it was found in abundance at Arthur's Seat, Edinburgh, and its distribution is now much better known. It has been found in most of the Scotch counties as far north as the Firth of Cromarty, and is especially abundant on the coasts of Fife, Forfar, and Kincardine. It is also occasionally taken among other forms in the northern counties of England, extending as far as Richmond, Yorks., and is reported also from Ireland. Specimens have been taken at Clonbrock in Galway by Dillon (*Ent.*, xxvii., p. 89), and identified by Kane, and there is one in the Brit. Mus. coll. labelled "Dublin," but without further data. There is also a record from the Crimea.\*

The usual form of var. *artaxerxes* is that in which there is a white discoidal spot on the upperside of the forewings, and an entire absence of black pupils to all the eyespots, including the discoidals, on the underside. The amount of orange-red on the uppersides varies greatly, from entire absence to a fairly complete border on fore and hindwings.

The following are aberrations of var. *artaxerxes*.

*a. ab. quadripuncta*, Tutt, "Brit. Butts.," p. 180 (1896); "Ent. Rec.," xiv., p. 114 (1902); Lamb., "Pap. Belg.," p. 229 (1902). *Quadripunctata*, Staud., "Cat.," 3rd ed., p. 83 (1901); Hagg., "Ent. Rec.," xiv., p. 247 (1902); Spuler, "Schmett. Eur.," p. 63 (1902); Harr., "Ent. Rec.," xviii., p. 236 (1906); Seitz, "Gross-Schmett.," p. 309 (1909); Rebel, "Berge's Schmett.," 9th ed., p. 68 (1909); Obth., "Lép. Comp.," iv., p. 250 (1910).—An extreme form of *artaxerxes*, with a white spot in the centre of the upperside of both fore- and hindwings (Tutt).

This form is illustrated by Newman (*Brit. Butts.*, p. 123) in the lowest of his three figures of *medon*, being apparently regarded by him as typical *artaxerxes*. This, however, is far from being the case; it is a distinctly scarce form, which is taken occasionally with the more usual specimens of this variety. Dalglish records, in particular, two examples from the coast cliffs at Stonehaven taken between July 10th and 25th, 1894 (*Ent.* xxvii., p. 353), and Ross has found it to be frequent and recurring in Fifeshire; Haggart also records it from Galashiels, and Horne from Muchalls in Kincardineshire.

*β. ab. caeruleopuncta*, n.ab. *Artaxerxes* ab., Haggart, "Ent. Rec.," xiv., p. 247 (1902). An aberration with the bright red marginal spots continuous down the outer margin of both fore- and hindwings, and also with the central spots in the centre of the forewings blue instead of white (Haggart).

This specimen was taken at Galashiels, and Haggart adds that it is a most striking variation. It is analogous to *Albulina pheretes*, ab.

\* This is almost certainly erroneous. The statement occurs in a list of captures (*Ent.* ii., pp. 230-1) made by Young in Persia, in the following passage: "*Lycæna argiolus*, *L. alsus*, *L. arion*, *L. corydon*, *L. adonis*, *L. alexis*. (The only place where I ever met with *L. artaxerxes* was on the Yaila Dag, above Yalta, in the Crimea, in June, 1856)." As no mention is made of *medon* under any of its other names, and as this form has never otherwise been met with outside the British Isles, it may, I think, be taken as almost certain that the name *artaxerxes* is used inadvertently as equivalent to *medon* (G. WHEELER).

*caeruleopunctata*, Wheel., a species which, like *artaxerxes*, has lost the black pupils of the eye-spots beneath, and would seem to suggest some affinity between the two species.\*

We now proceed to the northern English forms.

var. *salmacis*, Stphns., "Ill. Haust.," iii., p. 235 (1831);† †Dblly., "Syst. List," 1st ed., p. 1 (1850); †Hdnr., "Lep. Eur. Cat. Meth.," p. 14 (1851); Wailes, "Cat. Lep. Northd. Durh.," p. 23 (1858); Speyer, "Geogr. Verb.," p. 235 (1858); Staud., "Cat.," 1st ed., p. 5 (1861); Zell., "Ent. Mo. Mag.," iv., p. 77 (1867); Newm., "Brit. Butts.," p. 126, fig. 3 on p. 123, ♂, and fig. on p. 126, ♀ (1871); Kirby, "Syn. Cat.," p. 364 (1871); Staud., "Cat.," 2nd ed., p. 11 (1871); Kirby, "Eur. Butts.," p. 50 (1879); Lang, "Butts. Eur.," p. 115 (1884); Kane, "Eur. Butts.," p. 41 (1885); Buckl., "Larvæ," i., p. 117 (1886); Dale, "Hist. Brit. Butts.," p. 74 (1890); Barr., "Lep. Brit. Isl.," i., p. 74, pl. x., fig. 3g (1893); Rühl, "Pal. Gr.-Schmett.," pp. 261 (1893), 759 (1895); Tutt, "Brit. Butts.," p. 180 (1896); Obth., "Et.," xx., p. 25 (1896); Kirby, "Hndbk.," ii., p. 100, pl. xlviii., figs. 3-5 (1896); Staud., "Cat.," 3rd ed., p. 83 (1901); Spuler, "Schmett. Eur.," p. 63 (1902); Lamb., "Pap. Belg.," p. 229 (1902); Tutt, "Ent. Rec.," xiv., p. 113 (1902); Harr., "Ent. Rec.," xvii., p. 280 (1905); xviii., p. 236 (1906); South, "Brit. Butts.," p. 161, pl. cv., figs. 11, 13, 14 (1906); Reb., "Berges Schmett.," 9th ed., p. 68 (1907); Seitz, "Gr.-Schmett.," p. 309 (1909); Obth., "Lép. Comp.," iv., p. 250 (1910).—*Alis fusco-nigris*, subtus fusciscentibus maculis subocellatis, anticis supra in masculis puncto discoidali atro, in feminis albo, posticis utrinque fascia submarginali rubra. Taken on Castle Eden Dene. G. Wailes (Stephens).

Stephens' types are in the Brit. Mus. Coll. and do not contradict any part of his description; the latter, however, seems to imply that on the upperside there is no orange on the forewings. This is not the case; the ♂ has slight traces on the lower half of the forewing, and 4 slight orange lunules on the hindwing; the ♀ well-marked orange lunules on the hindwing, and orange spots on the forewing. On the underside the orange is very pale in the ♂, but bright in the ♀.

In view both of the description and the type specimens, however unsatisfactory the diagnosis, Harrison's action (*Ent. Rec.*, xviii., p. 236) in "restricting" the name to those of each sex which have the white discoidal on the upperside of the forewings but are otherwise like "*astrarche*" is quite *ultra vires*. He also ignores the fact that Stephens in his description specially mentions the underside spots as slight (*maculis subocellatis*), and we know from Wailes' description that the specimens he took, some of which he sent to Stephens, were remarkable for the diminution in the size of the black pupils, a mark which is very striking in the type-specimens. We must therefore retain the name for those specimens which have *small* black pupils to the eyespots on the underside, and a black discoidal on the upperside of the forewing in the ♂ and a white one in the ♀. It is true that this leaves us without a name for the ♂ with the white discoidal on the upperside, for which we now supply the name ab. ♂ *similis*, n. ab. It must be supposed that Harrison (as indeed he implies) does not draw any distinction between the undersides with small and those with ordinary-sized pupils to the eye-spots, but only between those that have these pupils and those that have none. It must also be borne in mind that every gradation exists between the southern

\* The two species will be found placed together in my *Butts. of Switz.*, etc., the affinities between them appearing to me indubitable, though I was not at the time aware of this confirmation (G.W.).

† For other records see Synonymy of species, under *Salmacis*, p. 230.

‡ As var. of *artaxerxes*, which is regarded as a species.

English form and var. *artaxerxes*, and that the name *salmacis* has generally been loosely employed for all these gradations; more particularly, and quite incorrectly, for those in which the black discoidal of the upperside of the forewing is entirely, or partially, surrounded by white, a form which Harrison has very rightly distinguished as ab. *albiannulata*, and transitions to which are by no means scarce elsewhere than in the North of England, and are indeed to be found, occasionally even in a pronounced form, on the Continent. There is as great a variation in these northern specimens in the amount of orange-red on the upperside as in var. *artaxerxes*, but it seems unnecessary to name the different forms, as they can readily be distinguished as *artaxerxes-allous*, *artaxerxes-agestis*, *salmacis-agestis*, etc.; Harrison's *semi-allous* (*Ent. Rec.*, xviii., p. 236) is the form incorrectly figured by Hübner as *agestis* (see p. 253).

The headquarters of var. *salmacis* may be stated to be the county of Durham, especially on the coast, but it is quite impossible to separate the cases in which authors have used the name in the strict sense of Stephens' diagnosis, from those in which they have used it for the *parvipuncta* and *albiannulata* forms of *medon*, since they generally draw no distinction; still less is it possible to separate specimens of our ab. *similis*, since these are always included under *salmacis*. This is of course natural, and was, so long as *salmacis* was regarded as a distinct species, correct, as all the aberrational forms would be included under the specific name; yet it was but a short time after the publication of the original descriptions that this was objected to by Wailes (*Entom. Mag.* i., p. 42, 1832) as being not only inadequate but incorrect, since neither the black nor the white discoidal was peculiar to either sex of the supposed species, and, in fact, the majority of those possessing the latter were males. How entirely this wider signification of the name was accepted may be judged from two instances of very different dates. The first is Newman's description quoted above (p. 241) published in 1834, (*Entom. Mag.*, ii., p. 515), the other Barrett's observations on the subject published in 1893 (*Lep. Brit. Isl.*, i., p. 73), which are as follows: "This form of variation, [diminution in the orange-red band] which occurs generally, becomes intensified in the North of England, particularly on the Durham coast, the orange spots of the upperside being commonly absent in the ♂, and smaller in the ♀, while a white edging has made its appearance round the central black spot and the black spots of the underside are decidedly smaller. This is the variety named *salmacis* by Stephens." As a matter of fact, the *albiannulata* form is not referred to by Stephens at all, though many authors have assumed it to be characteristic of var. *salmacis*. It is first referred to by Wailes in 1832 (*Entom. Mag.*, i., p. 42). In the wider sense *salmacis* has been taken frequently in all the northern English counties, though it is commoner on the eastern coast than in the west. It is reported as common at Richmond, Yorks., Grange and Witherslack, Lancs., Arnside, Westmoreland, and is recorded from Cumberland and from the Kendal district, as well as from many places on the Durham and Northumberland coasts. In Scotland it has been found at Dumfries, and in Berwickshire at Dunse and St. Abb's Head, and occasionally appears elsewhere with var. *artaxerxes*. Harrison states that only one out of forty-five Scotch specimens in his possession was of this form. In

the South of England it occurs only as a very scarce aberration, though it is reported from Southsea (Moncreaff), Paignton (Goodall), Brighton (Cooke), Dartmoor (Leach), and Croydon (Banks); there are also records of other specimens vaguely said to have been taken "in the south." Except in the form of ab. *albiannulata* there are no records from abroad.

The following may be regarded as aberrations of the var. *salmacis* (*sensu latiore*):—

α. ab. *albiannulata*, Harr., "Ent. Rec.," xviii., p. 236 (1906); Rebel, "Berge's Schmett.," 9th ed., p. 68 (1909).—As in *P. astrarche* except that the black discoidal spot is surrounded by a white ring (Harrison).

This is in part the *salmacis* of many authors, but must be taken, in accordance with Harrison's method of distinction, to include all those specimens whose black discoidal spot is surrounded with white, which have pupils—of whatever size—to the spots on the underside. It appears to be an abundant form on the Durham coast, and is generally distributed in the range of var. *salmacis*. It is not very uncommon as an aberration in the South (Hodgson), though the specific records are few; they include: Sussex, summer, 1894 (Christy), Tring (Rothschild), Bristol (Vaughan), Colchester (Harwood), Winchester (Mason coll.), and Purbeck (Banks). Sparre-Schneider records a specimen from Christiania, and in the Brit. Mus. coll. is one from Berlin. Transitional forms, with a few white scales bordering some part of the discoidal spot, may often be seen, and occur, for instance, in a considerable number of the Brittany specimens of var. *gallica*; they also occasionally appear in the Himalayan var. *nazira*.

β. ab. *vedrae*, Harr., "Ent. Rec.," xvii., p. 281 (1905); xviii., p. 236 (1906); Seitz, "Gross-Schmett.," p. 309 (1909); Rebel, "Berge's Schmett.," 9th ed., p. 68 (1909).—Upperside: hindwings with the row of red spots developed, but each spot reduced in size. Forewings with the row of red spots reduced to two near the anal angle. Discal spot black, edged with white scales. Underside: hindwings, all the white ocelli, together with the black pupils are entirely absent, except two. These are the discal scar (without pupil), and a minute one (with pupil) near the anal angle. Not even the white ocelli occur, as in *P. artaxerxes*, and, in consequence, the ground colour appears of a darker brown. Forewings are normal in the majority of the examples, but in a few extreme cases they follow the hindwing exactly. For this form I suggest the name ab. *vedrae*. (Harrison).

This form appears to be confined to the Durham coast, where in certain spots it is not uncommon, and, from the description in Wailes' *Catalogue*, p. 31, of a specimen taken by him at Castle Eden in July, 1856, it has evidently occurred there for a long period; this specimen, however, was of the extreme form mentioned above, and belongs rather to ab. *impunctata*, Obth. (v. *infra*).

γ. ab. *semi-vedrae*, Harr., "Ent. Rec.," xviii., p. 236 (1906).—A normal sized form, underside colours normal, but ocelli (especially close inward from the white median dash) becoming obsolete (Harrison).

Another of the Durham forms.

δ. ab. *albimaculata*, Harr., "Ent. Rec.," xvii., p. 281 (1905); Seitz, "Gross-Schmett.," p. 309 (1909).—Another interesting form which is really an aberration of the above [*vedrae*], occurs more sparingly, but has a more extended range. On the underside it agrees with ab. *vedrae*. Above, however, each red spot of the sub-terminal band on the hindwings is followed by a clear white dash. This form I propose to name ab. *albimaculata* (Harrison).

These narrow white dashes, which, small as they are, show very conspicuously, are not uncommon in specimens which do not resemble ab. *vedrae* on the underside (v. *infra*, p. 257).



ε. ab. *inclara*, Harr., "Ent. Rec.," xvii., p. 281 (1905); xviii., p. 236 (1906); Seitz, "Gross-Schmett.," p. 309 (1909).—Another form I wish to note is a dwarf form. It occurs throughout the range of *salmacis* and *artaxerxes*. It expands two-thirds the size of type *P. astrarche*. Beneath, the wings are of a silvery-grey, like that of *Cupido minima*. The white ocelli are very small and indistinct, and the row of four near the basal angle is reduced to two. This is of common occurrence, and when at rest is readily distinguished. The name ab. *inclara* will suffice to determine this (Harrison).

The four last-named aberrations all tend in the direction of obsolescence of the underside spotting; the next, while normal in the markings of the underside has a remarkably strong tendency towards the extreme form of var *artaxerxes* on the upperside.

ζ. ab. *subquadripunctata*, Harr., "Ent. Rec.," xviii., p. 236 (1906).—As in *quadripunctata*, but with ocelli with black pupils (Harrison).

This is another of the forms taken occasionally in Durham with sufficient frequency not to be regarded as merely a casual aberration, for Harrison distinctly states (*loc. cit.*, p. 237) that all such are excluded from the tabulated list he gives. It is a variation all the more remarkable from the fact that, although *artaxerxes* occurs in the same locality, ab. *quadripuncta* has never been met with there. This form also occurs occasionally in Lancashire and Westmoreland (Hodgson).

η. ab. *brunnescens*, Harr., "Ent. Rec.," xviii., p. 236 (1906); Seitz, "Gr.-Schmett.," p. 309 (1909).—Above, fringes brown, otherwise normal; beneath of a rich warm brown, almost chocolate. The white wedge suffused with brown; fringes sharply divided into an inward white band, and an outward brown band (Harrison).

This aberration is very close to var. *calida*, Bell., in the dark fringe, as well as in the ground colour of the underside and in the suffusion of the white dash on the hindwing. The latter, which is specially mentioned in the original description of *calida*, is not brought out in the original figure, where the dash, though narrow, is very conspicuous. It is, however, very difficult to judge of the colouring in the figure as it has changed with time past all recognition. This form, however, differs from *calida* on the upperside, the orange-red spots being neither larger nor brighter than usual. *Brunnescens* is another of the Durham forms.

θ. ab. *fumata*, n. ab.; *salmacis*, ab., Madd., "Ent. Rec.," i., p. 180 (1890).—Underside of all the wings a curious smoky black, with the spots almost obscured (Maddison).

This aberration is also described as having been taken on the Durham coast.

ι. ab. *nigropuncta*, n. ab. *Artaxerxes*, ab., Barr., "Lep. Brit. Isl.," i., p. 75, pl. x., fig. 3f.

The specimen figured by Barrett was taken by Robson, at, or near, Hartlepool, where he had taken another similar aberration. It is the exact reverse of the usual form of *artaxerxes*, the white on the underside having disappeared, while the black pupils remain on a coffee-coloured ground. The white streak on the hindwing is absent, and this form seems to be very near to ab. *brunnescens*, Harr., and still nearer to ab. *fumata*.

#### CENTRAL AND EASTERN ASIATIC RACES.

α. var. *nazira*, Moore, "Proc. Zool. Soc. Lond.," p. 504, pl. xxxi., fig. 4 (1865); p. 246 (1882); Kirby, "Syn. Cat.," p. 766 (1871); Butl., "Proc. Zool. Soc. Lond.," p. 368 (1886).—Upperside satin brown, forewing with a black spot closing

the discoidal cell; both wings with a marginal series of blackish dots, bordered inwardly with a submarginal row of deep red lunules. Underside purplish cream colour; both wings with a submarginal red band, bordered exteriorly with black dots, internally with blackish lunules, and margined on both sides with white lunules; forewing with a spot closing the cell, five and geminated sixth irregularly across the disk; and hindwing with 8 spots also irregularly across the disk; three basal and one closing the cell black each encircled with white; a dash of white longitudinally on the disk of the hindwing. Cilia broad, white, with black spots. Expanse one inch. Habitat Kunawur (Moore).

This is the form of the South-west Himalayas, and is also taken in Persia at Teheran. It differs from the usual central European form with narrow orange-red bands only in the ground-colour of the upperside, which is of a decidedly lighter brown, (without the red shade which is so conspicuous in the North African and South European forms, and yet more so in that from the Canary Islands), and in the more pronounced black marginal spots of the hindwing on the upperside. The type specimen, with many of Moore's others, is in the Brit. Mus. coll. The description is evidently not taken from this specimen, which has very little orange on the upperside, though it is present on both wings; the spots on the forewings are not lunular nor is the "band" (such part of it as exists) deep red. "Purplish cream colour" on the underside stands for a clear light brown, a very usual colour in British and other central European specimens. Some of the other specimens in the Brit. Mus. coll. have more orange than the type specimen, but it is always narrow and never deep red, nor is the "band" ever complete on the forewing. The fringe, described as "white with black spots," is really chequered with brown on the hindwing, sometimes on both, just as in European specimens not coming from high altitudes. One cannot imagine how it was that this was not immediately recognized as a race of *A. medon*, as a synonym of which all subsequent writers have treated it. Examples in the Brit. Mus. coll. come from Kunawur (type), Simla, Ranikhet (3, x., 92, 12, viii., 93), Kangra, Mandi (October 5th-15th, 1883), Gorais Valley, 8,000ft. (June), and Scind Valley, 7,000; also from Teheran, Persia.

β. var. *chinensis*, Murr., "Trans. Ent. Soc. Lond.," p. 523, pl. x., fig. 5 (1874); Leech, "Butts. China," ii., p. 315 (1894); Staud., "Cat.," 3rd ed., p. 83 (1901); Obth., "Lép. Comp.," iv., p. 253 (1910). *Mandschurica*,\* Staud., "Rom. Mém. Lép.," vi., p. 161 (1892); Rühl, "Pal. Gr.-Schmett.," p. 262 (1893).—Wings brown above, with a conspicuous submarginal band, equally marked on both wings, and a faint black streak closing cell. In the forewing the orange band is divided by the veins into almost square spots; in the hindwing the band is composed of a series of contiguous crescents, seated upon a row of black spots. Fringe white, interrupted by brown. Underside: pale grey-brown, the orange band as conspicuous as above, continuous in both wings. Forewing: no spot between base and disco-cellular spot. Beyond middle is a discal row of seven spots, twice bent at a right angle, so that the sixth is immediately below the disco-cellular spot: the costal spot is small and indistinct. All these spots are white-ringed. The orange band is edged on both sides by a row of spots, the innermost row consisting of larger, but less well-defined spots than the outer. Hindwing: a basal row of four spots, a disco-cellular spot, and a discal row of eight spots, much curved and angulated, all white-ringed. The orange band is edged as on forewing by rows of spots, but in this case the spots of the outer row are larger than those of the inner. In both wings the fringe, which is spotted, is preceded by a narrow black line. Expands 1 in. 3 lines. Habitat North China (Murray).

\* Blachier's reference to this name, *Ann. Soc. Ent. Fr.*, p. 258 (1889), must have been taken from one of Staudinger's sale catalogues, as it was not published till 1892.

The author adds that judging from the markings on the underside *chinensis* is most nearly allied to *Lycaena pylaon*, Fabr., while the upperside reminds one strongly of *L. astrarche*, Bergs.

Staudinger's *mandschurica* described in the Romanoff memoirs (vi. p. 161) is the same form, and is given by him as a synonym of *chinensis* in the 3rd ed. of his Catalogue. He observes that he received it in numbers from North China from Hertz, who had taken it at Ta-shansi, north of Pekin, throughout June and July. He had originally listed it as a var. of *medon*, but afterwards considered it a separate species. We have already (p. 240) remarked on the points on which he relied as differentiating it, and shown that they all exist in other forms of *A. medon*. The most striking character on the upperside is the strongly denticulated inner edge of the orange band, but this we find to be equally the case in most specimens of var. *cramera*, and in some of the Sicilian and Sardinian examples. One of Herz's specimens, labelled "Pekin," is in the Brit. Mus. coll., but there is also another, quite similar, from Dschungaria. With its smaller form *myrmecias*, specimens of which in the Brit. Mus. coll. are labelled "Tekke" and "Karamouk," and which was originally discovered near Krasnovodsk, on the Eastern shore of the Caspian, the range of this form in Asia is a very wide one.

Its identity with *A. medon* is still uncertain, but only the careful comparison of the genitalia can settle the question; there is, however, no reliable superficial distinction.

γ. var. *myrmecias*, Chrstph., "Hor. Soc. Ent. Ross.," xii., p. 235, pl. v., fig. 7 (1877); Rühl, "Pal. Gr.-Schmett.," p. 248 (1893); Staud., "Cat.," 3rd ed., p. 83 (1901).—*Alis integris fuscis, virescente-nitidulis, lunula media nigra, fascia maculari omnium rufa, fimbriis albis, fusco-alternatis; subtus virescenti-cinereis, maculis ocellaribus, ut in L. eurypilo, sed minoribus, fascia submarginali lata rufa.* Exp. al. ant. ♂ 10mm. ♀ 11mm. (Christoph.).

The upper side is described (*loc. cit.*) as being like *astrarche* except that the orange is broader and that there is a greenish reflection which is stated by the author (quite erroneously) not to occur in the latter species. The underside he states to be like *eurypilus*, but, judging both by the illustration accompanying the description, and from the specimens in the Brit. Mus. coll., the resemblance is purely imaginary.

This form was originally found in May about 20 miles inland from Krasnovodsk; it was scarce, and frequented the flowers of a bright yellow *Centaurea*. It is merely a smaller form of the preceding, and as varieties of *medon* they stand or fall together.

#### EUROPEAN AND MEDITERRANEAN RACES.

The remaining races differ from each other in two points, *viz.*, the amount of orange-red on the upperside, and the ground-colour of the the underside, and while some of these forms are very wide-spread, others have a more or less restricted range. It will, however, be convenient to deal with them together.

Hüfnagel's type, then, is the small brown form without any spotting on the upperside, and without an inclination to black on the one hand, nor to red-brown on the other. It is in no way surprising that this is the form with which he was acquainted, though he considered it scarce, as it seems to be pretty generally distributed over north-central Europe. An example in the Brit. Mus. coll. from Denmark corresponds in every respect with his description. The

forms most nearly approaching this are *ab. allous*, Hb., var. *sarmatis*, Gr.-Gr., var. *semi-allous*, Harr., var. *alpina*, Staud., and var. *montana*, Rühl, all of which are distinguished by the partial, or complete, absence of the orange-red macular band on the upperside. We will consider these separately.

*a. var. (and ab.) allous*, Hb., "Eur. Schmett.," i., pl. cc., figs. 989-990 (1834-41); \*Hch.-Sch., "Sys. Bearb.," i., p. 124 (1843); Dup., "Cat. Méth.," p. 32 (1844); Dbldy., "List.," p. 2 (1856); Staud., "Cat.," 1st ed., p. 5 (1861); Berce, "Fn. Fr.," i., p. 139 (1867); Kirby, "Syn. Cat.," p. 364 (1871); Staud., "Cat.," 2nd ed., p. 11 (1871); Bang-Haas, "Nat. Tids.," ix., 3rd ser., p. 395 (1874); Curò, "Bull. Soc. Ent. It.," vi., p. 111 (1874); Kirby, "Eur. Butts.," p. 50 (1879); Alph., "Hor. Soc. Ent. Ross.," xvi., p. 386 (1881); Lang., "Butts. Eur.," p. 115 (1884); Kane, "Eur. Butts.," p. 41 (1885); Lampä, "Ent. Tids.," vi., p. 14 (1885); Kill., "Ins. Graub.," p. 19 (1886); Auriv., "Nord. Fjär.," p. 13 (1888); Dale, "Hist. Brit. Butts.," p. 74 (1890); Reut., "Acta F. F. Fenn.," ix., pt. 6, p. 13 (1893); Rühl, "Pal. Gr.-Schmett.," pp. 261 (1893), 759 (1895); Tutt, "Brit. Butts.," p. 180 (1896); Bachm., "Soc. Ent.," xi., p. 151 (1896); Kirby, "Hndbk.," ii., p. 100 (1896); Obth., "Ét.," xx., p. 25 (1896); Favre, "Macr.-Lép. Val.," p. 18 (1899); Staud., "Cat.," 3rd ed., p. 83 (1901); Fleck, "Macr.-Lép. Rumän.," p. 20 (1901); Lamb., "Pap. Belg.," p. 229 (1902); Spuler, "Schmett. Eur.," p. 63 (1902); Wheel., "Butts. Switz.," etc., p. 38 (1903); South, "Brit. Butts.," p. 161 (1906); Rebel, "Berge's Schmett.," 9th ed., p. 68 (1909); Seitz, "Gr.-Schmett.," p. 309, pl. lxxix., k (1909); Obth., "Lép. Comp.," iv., p. 250 (1910). *Idas*, Kef., "Stett. Ent. Zeit.," i., p. 174 (1840); xii., p. 309 (1851); Hdnr., "Lep. Eur. Cat. Meth.," p. 14 (1851); Gerh., "Mon.," p. 15, pl., xxvi., figs. 4a, b (1852); M.-Dür., "Schmett. Schweiz.," p. 74 (1852). *Agestis*, var. *b*, Wllgrn., "Skand. Dagf.," p. 214 (1853).

Hübner's figures are not accompanied by any description, and his illustrations on pl. cc. comprise two ♂s and one ♀ uppersides and an underside of each sex. Of these only fig. 990 is without spots, the other two uppersides 988 and 991 differ but little from his previous figures of "*agestis*," pl. lxii., figs. 303-306. Staudinger, in the 2nd ed. of his *Catalogue* (1871), seems to have been the first definitely to restrict the name to the form entirely without spots on the upperside though Berce had evidently intended to do so, but, after speaking of *allous* as the form without spots, he added that a few small ones were often perceptible. Since the appearance of this edition of the *Catalogue*, however, the restriction has been almost universally accepted, indeed, South is the only authority by whom we have found even the most slightly spotted form included, except in our own *British Butterflies* (1896). Dale, to whose addiction to romance we have previously had occasion to refer, states that all the second-brood specimens of Southern Europe are of this form, whereas, in point of fact, the form is almost unknown in Southern Europe. He was probably misled by Kirby's somewhat less wholesale statement (*Eur. Butts.*, p. 50) that *allous* is the second brood in Southern Europe, and both mistakes are, no doubt, due to Staudinger's action previous to 1871, in sending out (as he himself states) the form which he later described as *aestiva* under the name *allous*. What Bromilow intended under this name it is impossible to say, as he only calls it a varietal form of the second-brood. Hydenreich, Keferstein, Meyer-Dür, and Gerhard regard Rambur's *idas* as this form of *medon*; the former also looks upon Herrich-Schäffer's *anteros* (*Sys. Bearb.*, i., pl. v., figs. 26, 27) as equivalent to *allous*, whereas it certainly does not represent any

\* As an ab. of *idas*, Rmbr., which he regards as a form of "*agestis*."

form of *medon*, as is clearly shown by the conspicuous basal spot on the underside of the forewing.

It is possible that the name should be regarded as synonymic with *medon*, Hüfn., but the later is specially stated to be very small, whereas the *allous* form is often conspicuously large; the specimens from Amurland, where this form, or something closely approaching it, appears to be racial, are among the largest known. In northern and central Europe it is widely distributed, but in its restricted sense is not a very common aberration. Many of the magazine references, especially in the case of specimens from the Alps, should rather be considered as var. *alpina*, though the restricted ab. *allous* is also commoner in the Alps than elsewhere. In northern latitudes it is reported by Aurivillius from Scandinavia, but is stated to be scarce; Reuter announces it from Finland as occurring sometimes with the type; Nolcken mentions specimens from Russian Provinces on the east of the Baltic; it occurs in the lists of Lampa from Finland and Bang-Haas from Denmark; Harrison reports it singly from the neighbourhood of Durham. The reports of its occurrence "commonly" at Arneside refer, we suspect, to ab. *semi-allous*, Harr. It occurs not uncommonly, as we have stated, throughout the alpine region of central Europe, where specimens closely approaching it are very frequent. Fleck reports it singly from Roumania, Bachmetjew, as very scarce near Sofia, there are also two large Bulgarian specimens in the Brit. Mus. coll. In the northern parts of Asia, and in the mountains, this form seems to become much commoner. Alphéraky found it as common as the orange-bordered form in the Kouljâ and Tian-Chian districts. Graeser found it scarce at Nicolaiefsk, but common at Chabarofka, and abundant at Pokrofska; Dörries also found it in numbers in the Sutschan district; all the specimens taken by Graeser as well as the only two taken at Raddefka and on the island of Askold by Christoph and Dörries respectively were of this form, so that it is essentially the dominant form in the Amur district, and in many parts of it appears to be the only one found.

β. var. *sarmatis*, Gr.-Gr., "Rom. Mém. Lép.," iv., p. 393 (1890); Rühl, "Pal. Gr.-Schmett.," pp. 262 (1893), 759 (1895); Tutt, "Brit. Butts.," p. 181 (1896); Staud., "Cat.," 3rd ed., p. 83 (1901); Lamb., "Pap. Belg.," p. 229 (1902); Seitz, "Gr.-Schmett.," p. 309 (1909); Rebel, "Berge's Schmett.," 9th ed., p. 68 (1909); Courv., "Ent. Zeits.," xxiv., p. 126 (1910). *Sarmates*, Spuler, "Schmett. Eur.," p. 63 (1902).—The *astrache* of Southern Russia is distinguished from all other varieties by the entirely white underside of both wings, and by a fairly broad red band on the underside of the wings. I name this form var. *sarmatis* (Grum-Grshimailo).

The specimens of this variety in the Brit. Mus. coll., from that of Grum-Grshimailo, show a very distinctive form. They have no touch of red on the upperside, and the wings have a rather narrow and slightly pointed appearance. The whiteness of the underside, however, is hardly as conspicuous as in many specimens from Asia Minor and some from Syria. These specimens, which are labelled "*sarmatis*" by Grum all come from S.E. Russia; but specimens from Sarepta in the Brit. Mus. coll. have a bright but narrow band of orange on the upperside on all the wings. The four specimens in the same collection from Sary Ob are quite of the *sarmatis* form, which therefore extends into E. Turkestan; they differ from the Ural specimens only in being slightly smaller.

γ. var. *semi-allous*, Harr., "Ent. Rec.," xviii., p. 236 (1906). *Agestis*, Hb.,

"Eur. Schmett.," i., pl. lxii., figs. 303-306. *Allous*, Hb., "Eur. Schmett.," i., pl. cc., figs. 988, 991-2 (1834-1841); Hch.-Sch., "Sys. Bearb.," i., p. 124 (1843) [*in part*]; Hdnr., "Lep. Eur. Cat. Meth.," p. 14 (1851); Staud., "Cat.," 1st ed., p. 5 (1861) [*in part*]; Kirby, "Syn. Cat.," p. 364 (1861) [*in part*]; Tutt, "Brit. Butts.," p. 180 (1896) [*in part*]; South, "Brit. Butts.," p. 161, [*in part*], pl. cv., fig. 11 (1906).—As in *P. astrarche*, except that the row of red spots above is becoming obsolete (Harrison).

Harrison regards this form as part of what Stephens meant by his var. *salmacis*, but, except in the sense that it is found in the same localities, there is no justification for this, as it does not possess the distinctive marks of the type specimens or of the description. It is an extremely common form, probably the commonest in high latitudes and at fairly high altitudes in Europe, where the small dark var. *alpina* does not take its place. In the earlier writers it was generally included under *allous*, since Hübner figured two males and a female under that name, of which only one, fig. 990, was without red on the upper-side. In later writers, however, it is not generally distinguished by any varietal name but is included under the general name employed for the species.

♂. var. *alpina*, Staud., "Hor. Soc. Ent. Ross.," vii., p. 52 (1871); Rühl, "Pal. Gr.-Schmett.," p. 262 (1893); Tutt, "Brit. Butts.," p. 181 (1896); Lamb., "Pap. Belg.," p. 229 (1902); Wheel., "Butts. Switz.," &c., p. 38 (1903); Seitz, "Gr.-Schmett.," p. 309 (1909).—Interesting is a small alpine form in which the ♂ is always quite dark on the upperside and which might be called var. *alpina*. The specimens from the extreme north are the same, and one meets with specimens everywhere with a dark upperside as aberrations, but, as a general rule they are much larger (Staudinger).

This description of the var. *alpina* occurs in an account of the butterflies taken in Greece, it may therefore be presumed that the type specimens came from the mountains of that country; as it is stated that the specimens from the extreme north are exactly like those here described, and as nothing is said as to the complete absence of orange-red on the upperside, which is a somewhat scarce aberration even in the extreme north, the description must be taken to cover all small specimens in which the ground-colour of the upperside is of a deep black-brown tint, whether they possess traces of the orange-red macular band or not.

This is a very common form, not only in the high Alps but in the first brood in such sub-alpine districts as the Rhone Valley in Switzerland; it is sometimes quite impossible to distinguish between spring specimens from Bex, for example, and those of the single brood taken between 6000 and 7000 ft. up on the Albula Pass. Entirely spotless ♂ examples (on the upperside) with very dark ground-colour are by no means uncommon at the highest altitudes inhabited by the species, and specimens exist in the Brit. Mus. coll. from many widely separated alpine localities. It is, however, more usual to find traces, or even two or three very narrow lunules, of the orange-red band on the hindwing. In this form it is of very wide occurrence, and is certainly the most usual variety in the highest part of its range from the point of view of altitude, as well as being, as Staudinger says, an ordinary form in the North. It occurs occasionally, though rarely, in England.

ε. var. *montana*, Rühl, "Pal. Gr.-Schmett.," p. 759 (1895); Seitz, "Gr.-Schmett.," p. 309 (1909). *Nevadensis*, Obth., "Lép. Comp.," iv., p. 250 (1910). *Agestis* var., Rmbr., "Fn. And.," p. 266 (1839); "Cat. Lep. And.," p. 37 (1858).

—Large examples with very little red on the upperside and considerably lighter underside (Rühl).

This name was given by Rühl to the large form found in the Andalusian mountains, and is therefore the same as that more adequately described by Oberthür, under the name *nevadensis*, as differing from Hübner's figure of *allous*, 988 (not the uniformly brown upperside) by its noticeably larger size and the creamy yellow tinged with pink of the underside of the ♂. The ♀, he adds, has the underside of the wings reddish-brown, and a border of red spots on the four wings. He records it as flying in July in the Sierra Nevada and the Sierra d'Alfakar, and also as occurring at Vernet in the Pyrenees. In the southern Spanish Sierras it occurs in both broods; there is a short series of spring specimens in the Brit. Mus. coll., corresponding entirely with Oberthür's description; it is therefore not confined to the July brood.

s. var. *agestis*, Schiff., "Schmett. Wien.," p. 148 (1776). *Astrarche*, Brgstr., "Nomen.," iii., p. 4, pl. xlix., figs. 7, 8 (1780). [Included under the names *medon*, *agestis*, *astrarche*, in the synonymy of the species pp. 227-8; but not the form figured as *agestis* by Hübner, *Eur. Schmett.*, i., pl. lxii., figs. 303-306, nor as *medon* by Esper, *Schmett. Eur.*, i., pt. 2, pl. lv., fig. 7.] Light flame-blue (the ♂) or coffee-brown (the ♀), with complete border of spots (Schiffermüller).

What Schiffermüller took to be the ♂ of this species is unknown, and it is quite possible that he only supposed the ♂ to be blue on the analogy of other related species; but with regard to the ♀ the testimony of Ochsenheimer seems quite conclusive; he had seen the specimens named by Schiffermüller, and was certain that they were this species, being himself fully aware that the ♂ is brown. The first figure under this name is that of Hübner (*Eur. Schmett.*, i., pl. lxii., figs. 303-306) which does not, however, represent the same form of the species, there being no orange on the forewing in the ♂, and very little in the ♀, and only a few lunules on the hindwing in either sex, whereas Schiffermüller describes it as "ganz randfleckiger." Bergsträsser, under the name *astrarche*, figures the ♀ only, and in this the narrow orange band reaches the costa. The original description of *agestis* also applies to the ♀ only, and the corresponding ♂ has generally a macular band of lunules on the hindwing failing towards the costa, and a similar band of squarish spots on the forewing extending from half to three-quarters of the way towards the costa. This is by far the commonest form in Central Europe, except at altitudes at which the vars. *semi-allous* or *alpina* prevail. It is also frequent in Southern Europe in the first brood, either mixed with var. *ornata* or as the dominant form. It is also by no means uncommon in the later broods, especially in the ♂, even when the ♀ takes the *aestiva* or even the *calida* form. It is frequently referred to in entomological literature as the "typical" form, as being the best known and the most widely spread; those writers who regard either *agestis*, Schiff., or *astrarche*, Bergst., as the specific name, will also naturally regard this as the typical form in the technical sense of the word.

η. var. *gallica*, Obth., "Lép. Comp.," iv., p. 252 (1910).—Intermediate between *agestis*, Hb., and *calida*, Bell.; the border of orange-red spots above is of a very vivid colour; in the ♂ the spots are smaller than in the ♀; they do not always reach the costa of the forewings, but very often in the ♂, and always in the ♀, the border of red spots begins close to the costa of the forewings, and continues to the inner margin of the hindwings. The underside of the ♂ is grey, of the ♀ reddish-brown. Environs of Paris, Brittany, Poitou, and certain parts of the Pyrenees (Oberthür).



This form might have been described as intermediate between *astrarche*, Bergs., and *ornata*, Staud., since it has a much deeper red border on the upperside than the former and more nearly resembles the latter on the underside than *calida*, though the border on the upperside is not so deep as in *ornata*. The ground colour of the upperside has a reddish tinge in the brown, like the more southern forms, and the marginal row of black spots on the hindwing is generally well developed. This form is somewhat widespread, occurring occasionally in the south of England, and extending into Turkey, where, according to Graves, it is the usual spring form on both sides of the Bosphorus. In the plains of France it occurs generally, and is the ordinary form in both spring and summer broods.

*θ. ab. ornata*, Staud., "Iris," p. 280 (1892); Rühl, "Pal. Gr.-Schmett.," p. 262 (1893); Tutt, "Brit. Butts.," p. 180 (1896); Staud., "Cat.," 3rd ed., p. 83 (1901); Spuler, "Schmett. Eur.," p. 63 (1902); Lamb., "Pap. Belg.," p. 229 (1902); Aig.-Ab., "Ent. Wechnbl.," xxv., p. 73 (1908); Grund, "Int. Ent. Zeits. Gub.," ii., p. 79 (1908); Seitz, "Gr.-Schmett.," i., p. 309, pl. lxxx., a (1909); Courv., "Ent. Zeits.," xxiv., p. 126 (1910).—Some of the specimens before me from Tunis hardly differ from the usual form, some have on the upperside a broad reddish band of marginal spots, while the underside is light grey, as in ordinary *astrarche*, I have met with similar specimens in abundance on the island of Sardinia. Also singly at Chiclana (Cadiz), and I have also a male from Teneriffe and a female from Corsica. I designate these *ab. ornata*, they belong (perhaps) always to the first brood, and predominate in certain localities in the South, and generally seem to occur only in the female sex (Staudinger).

Staudinger goes on to explain that his *ab. ornata* differs in the colour of the underside both from *calida*, Bell., and from *canariensis*, Blach. (i.e., *cramera*, Eschh.), and states that, in addition to the localities above mentioned, he possesses specimens of this form from Central Asia. It is the usual form of the spring brood in Morocco and Algiers, in southern Spain (except in the Sierras), in Sardinia, and in some parts of Sicily; it also occurs in Italy as far north as Orta (Lowe), in Dalmatia (Grund), in Hungary (Aigner-Abafi) and in Germany (Gillmer). The most pronounced specimens, in which the underside is white, occur in Syria and, more especially, in Asia Minor; there are specimens from both these localities in the Brit. Mus. coll., in fact all the spring specimens from the latter are of this variety in its most striking form.

*ι. var. aestiva*, Staud., "Hor. Soc. Ent. Ross.," vii., p. 52 (1871); "Cat.," 2nd ed., p. 11 (1871); Kirby, "Syn. Cat.," p. 766 (1871); Staud., "Hor. Soc. Ent. Ross.," xiv., p. 241 (1878); Peyerim., "Lép. Als.," 4th ed., p. 24 (1880); Kane, "Eur. Butts.," p. 41 (1885); Chrstph., "Rom. Mem. Lep.," iii., p. 52 (1887); Dale, "Hist. Brit. Butts.," p. 74 (1890); Staud., "Iris," v., p. 280 (1892); Rühl, "Pal. Gr.-Schmett.," pp. 261 (1893), 759 (1895); Tutt, "Brit. Butts.," p. 180 (1896); Bachm., "Soc. Ent.," xi., p. 151 (1896); Favre, "Macr.-Lép. Val.," p. 18 (1899); Steff., "Bull. Soc. Ent. It.," xxxii., p. 335 (1900); Staud., "Cat.," 3rd ed., p. 83 (1901); Fleck, "Macr.-Lép. Rumän.," p. 20 (1901); Aig.-Ab., "Ent. Wochbl.," xxv., p. 73 (1908); Seitz, "Gr.-Schmett.," i., p. 309 (1909); Courv., "Ent. Zeits.," xxiv., p. 126 (1910). *Medon*, Esp., "Schmett. Eur.," i., pt. 2, p. 31, pl. lv. [cont. v.], fig. 7 (1780). *Allous*, Gerh., "Mon.," p. 15, pl. xxvi., fig. 2 (1852); (?) Brom., "Butts. Riv.," p. 36 (1892). *Astiva*, Mosl., "Illus. Brit. Lep.," pt. vii., pl. ii., expl. (1880). *Calida*, Wheel., "Butts. Switz.," &c., p. 38 (1903).—Whereas the spring brood invariably exhibits a light grey colour beneath, there appear in the summer brood in Greece, as everywhere else in the south of Europe, specimens, ♀ particularly, with a deep grey-brown colouring of the underside. These latter have been sent out by mistake, by myself as well as others, as *ab. allous*, Hb., but it would be preferable were they called *var. aestiva meridionalis* (Staudinger).

This is the form in which the underside, especially in the ♀, is of a deep brown, without any considerable broadening in the orange-red band of the upperside (see *Iris*, v., p. 280, where Staudinger also quotes the name as *aestiva*); indeed, in some specimens it is less broad than is usual in var. *gallica*, and it differs markedly in this respect from var. *calida*. It is a much commoner second-brood form in southern Europe than might be inferred from Staudinger's observations quoted above, and also occurs not uncommonly in the hotter parts of Central Europe, extending, as a scarce aberration, as far as the north of England. It appears, however, never to occur as a mountain form. Esper's *medon* (pl. lv., fig. 7) seems referable here, and it is also Gerhard's *allous* (pl. xxvi., fig. 2).

κ. ab. *calida*, Bell., "Ann. Soc. Ent. Fr.," p. 615, pl. xiv., fig. 6 (1862); Kirby, "Syn. Cat.," p. 364 (1871); Curò, "Bull. Soc. Ent. It.," vi., p. 3 (1874); Rühl, "Pal. Gr.-Schmett.," p. 262 (1893); Tutt, "Brit. Butts.," p. 181 (1896); Obth., "Ét.," xx., p. 25 (1896); Staud., "Cat.," 3rd ed., p. 83 (1901); Spuler, "Schmett. Eur.," p. 63 (1902); Lamb., "Pap. Belg.," p. 229 (1902); Graves, "Ent. Rec.," xviii., p. 122 (1906); Grund, "Int. Ent. Zeits. Gub.," ii., p. 79 (1908); Seitz, "Gr.-Schmett.," i., p. 309, pl. lxxix., k, lxxx., a (1909); Rebel, "Berge's Schmett.," 9th ed., p. 68 (1909); Courv., "Ent. Zeits.," xxiv., p. 125 (1910); Obth., "Lep. Comp.," iv., p. 252 (1910). *L. agestis* has frequently afforded me a beautiful variety which I think should be described. The upperside is distinguished from ordinary specimens by its deeper colour, its larger and more vivid fulvous spots, and its darker fringe. The underside of both sexes, especially that of the ♀, is remarkable for its striking brick-red colouring. The white dash of the underside of the hindwings is reduced to a simple line, or in certain individuals is even completely wanting. This form belongs to the second brood. It appears during the hottest part of the summer (Bellier).

This form was described by Bellier de la Chavignerie from Corsican specimens, but it is widely distributed in the South, as an aberration of the second brood. The "deeper" colour of the upperside does not refer to any tendency towards black, but to the deep red-brown colour which is even more pronounced than is the case in *aestiva* or *ornata*, and resembles that of *cramera*. It is the usual form at Gibraltar, and seems to occur there even in the spring brood. It is certainly not confined exclusively to the later broods, since Oberthür took it early in May, near Algeciras, in 1894. It is, however, much more usual in the summer. It occurs in Sardinia, Sicily, Italy (as far north at any rate as Assisi), and Dalmatia; and is a usual form in the summer broods in Algeria, Morocco, Southern Spain, Syria, and Asia Minor.

[The name *fulminans* quoted by Grum-Grshimailo (*Rom. Mém. Léop.*, iv., p. 393), is a MS. name of Oberthür's of which no description has ever been published. There is in the Brit. Mus. coll. a specimen of var. *ornata* with very pronounced orange band on the upperside, and grey underside, from Algeria, labelled "*fulminans*, Oberthür," from the Elwes collection, and Oberthür states (*in litt.*) that the name was originally intended to include both forms now known as *ornata* and *calida*, but not having been published should be considered non-existent.—G. W.]

λ. var. *cramera*, Eschh., "Kotz. Reise Süd-see.," etc., iii., p. 217, pl. x., figs. 26 a, b (1821); Staud., "Cat.," 3rd ed., p. 83 (1901); Lamb., "Pap. Belg.," p. 229 (1902); Seitz, "Gross. Schmett.," p. 309, pl. lxxx., a (1909); Courv., "Ent. Zeits.," xxiv., p. 126 (1910). *Canariensis*, Blach., "Ann. Soc. Ent. Fr.," p. 258, pl. iv., figs. 7, 8 (1889); Staud., "Iris," v., p. 280 (1892). *Aestiva*, White, "Butts. Ten.," p. 41, pl. ii., fig. 6 (1894). *Lycaena alis supra brunneis, subtus*

griseis, fascia communi marginali utrinque fulva, subtus punctis nigris, albo cinctis. From Teneriffe (Eschholz).

A German description follows, the important parts of which are here translated:—Size and shape of *Lycaena icarus*. The colour of the wings on the upperside is a dark brown with a green silky gloss; scarcely half a line from the outer margin runs a band, more than half a line wide, yellowish red, and somewhat denticulated, on both sides of both wings. Beneath, the ground-colour of the wings is grey. . . . The specimen described is probably a ♀, the ♂ might have a totally different appearance.

Under the name *canariensis* this variety was again described and figured in both sexes, by Blachier in the *Annales* of the Entomological Society of France. He speaks of it as an exaggeration of var. *aestiva*, and observes that on the upperside, as well as the under, the red border forms a continuous band. The ground-colour of the underside he calls brown or dark fulvous. Eschholz describes the underside as grey, but figures it as brown. Indeed, the two figures correspond precisely, but the orange-red band has turned almost black,\* as is the case with other figures in the *Annales*.

There is considerable variation in the breadth of the orange-red border. The denticulation on its inner side is often very marked, as much so as in var. *chinensis*. The brown of the upperside is darker than is usual in *aestiva* and *ornata*. Specimens closely approaching this form occur occasionally in Sardinia, but with redder-brown upperside.

#### UPPERSIDE ABERRATIONS.

a. ab. *pallidior*, Obth., "Lép. Comp.," iv., p. 253 (1910).—The orange-red spots may become pale yellow (Oberthür).

No particular examples are quoted by Oberthür, but in the Brit. Mus. coll. is a Norwegian ♂ from the Elwes coll., taken at Skogstad, July 15th, 1887, with very pale spots on the hindwings, the forewings being without spots; on the underside the spots are still paler, and are present on both wings. In this specimen the black spots on the underside are small.

A very extreme form of this tendency is exemplified in the next-named aberration:—

3. ab. *graafii*, ver Huell, "Sepp's Ned. Vlind.," vii., Pref., p. ii., fig. on Titlepage (1843-1855); "Tijdsch. Ent.," iii., p. 12 (1860); Snell., "De Vlind.," i., p. 60 (1867); Kirby, "Syn. Cat.," p. 766 (1871). *Agestis* var., Herklots, "Bouwst. Fn. Ned.," ii., p. 221 (1853).—With white marginal spots in place of red (ver Huell).

This is a very striking form, and is beautifully illustrated on the title page of the 7th vol. of Sepp's *Nederlandsche Vlinders*; the white marginal spots forming chevrons on both wings. It appears, so far, to have been taken only in Holland, but has occurred there on three or four occasions and at different places. The first recorded was a very fresh ♂ taken by de Graaf at Wassenaar at the end of June, 1851, another was taken by ver Huell at Arnhem in 1853, another at Norwijk at the beginning of July, 1859, which was also in the de Graaf coll. There is a slight confusion in the records of this last specimen,

\* This is no doubt due to the use of vermilion, which always sooner or later becomes black (G.W.).

which leave it somewhat uncertain whether a similar specimen had not previously been taken in the same place.

γ. *ab. albosignata*, n. *ab.*—When the black spots external to the orange-red band are present, a white line sometimes occurs between these and the edge of the wings.

This is the aberration of which Harrison's *ab. albimaculata* is a particular case. Traces of it are very frequently to be seen with a lens, and are often visible to the naked eye. In extreme cases they are very conspicuous and give a very special facies. They may occur along the border of both wings, and occasionally do so in British examples, but are more commonly confined to the hindwing and the anal angle of the forewing (Hodgson). In the Brit. Mus. coll. are three very conspicuous examples from Turkestan, but these have no white on the forewing. It occurs very rarely in var. *nazira*, though the black spots are well developed, but is commoner in those forms in which the orange-red band is broad. In var. *cramera* we have only seen it in the ♂s, but in Greek specimens of var. *ornata* it is more pronounced in the ♀s. In this form it is specially common, and we have seen it in specimens from Sicily, Morocco, Asia Minor and Syria, equally in both sexes from the latter; it also appears in specimens of var. *calida* from Asia Minor, and of var. *gallica* from Brittany.

#### UNDERSIDE ABERRATIONS.

α. *ab. albicans*, Auriv., "Nord. Fjär.", p. 13 (1888); Seitz, "Gr.-Schmett.," p. 309 (1909); Courv., "Ent. Zeits.," xxiv., p. 126 (1910).—Wings beneath almost white, and so light that the discoidal spot on the hindwings and the white dash in cells 3 and 4 cannot be distinguished from the ground-colour. Eye-spots absent, or small and without rings. Found in Helsingland (Aurivillius).

This form is very near *ab. vedrae*, Harr., but in the latter the ground-colour on the underside is darker than usual instead of lighter. Klemensiewicz mentions a similar specimen taken near Lemberg, with very reduced yellow marginal spots and almost white underside, with only a few tiny eye-spots visible. Courvoisier states that he possesses examples of *ab. albicans* from Rome, the Tyrol, Odessa, and Amasia. He is singularly fortunate, we have never yet come across a specimen, and there is none in the Brit. Mus. coll.

The extreme form, in which the eye-spots are absent, had been separately described as:—

β. *ab. deleta*, Ckll., "Ent.," xxii., p. 99 (1889). *Agestis* var., Weston, "Ent.," xii., p. 185, fig. 1 (1879); Mosl., "Ill. Brit. Lep.," pt. 7, pl. ii., fig. 5 (1880). *Albicans*, Auriv., "Nord. Fjär.," p. 13 [*in part*] (1888).—The extraordinary variety figured above as No. 1, is from my collection, and was captured by me last season. The ground colour of the underside of all four wings is of a pearly white colour, while the row of red spots along the margins of the wings is very bright and distinct. Except the central spot of each front wing, and two others near the upper margin of the lower wings, the normal black spots are entirely absent (Weston).

Cockerell's name *deleta* was given with reference to the figure illustrating Weston's description; Mosley's illustration was taken from the same specimen. It would seem to be a scarce form, and is hitherto only reported from England and Scandinavia.

γ. *ab. impunctata*, Obth., "Feuille Jeunes Nat.," 4th ser., i., p. 17, pl. iv., fig. 18 (1900); "Lép. Comp.," iv., p. 253 (1910). *Vedrae*, Harr., "Ent. Rec.," xvii., p. 281 [*in part*] (1905). *Caeca*, Blach., "Bull. Soc. Lép. Gen.," ii., p. 54, pl. i., fig. 13 (1910).—The flax-grey ground of the underside is entirely without the usual black spots (Oberthür).

This only differs from the last in the ground-colour being grey instead of white. The specimen figured was taken by Austin at Folkestone, in 1890, and was in the Briggs coll.

δ. ab. *antero-obsolata*, n. ab.—Specimens showing obsolescence of the spotting on the forewing only.

This may occur either in the marginal or discal row of black spots. In the former case, which is common in northern England, it is one of the transitional forms to var. *artaxerxes*. In the latter case the black spots and their white circle tend equally to disappear. The partial absence of the discal row, as exemplified in the very frequent loss of the geminated spot, and the almost universal failure of the costal spot, has already been remarked upon (p. 233). Further obsolescence on the forewing is rare, but according to Hodgson not more so, in Britain, than on the hindwing.

ε. ab. *postico-obsolata*, n. ab.—Specimens showing obsolescence of the spotting on the hindwing only.

The commonest form of obsolescence on the hindwing is probably the absorption of one of the spots of the discal row in the light wedge-shaped streak, and next to this, the absence of the 3rd, or less frequently the lowest, basal spot. Others of the discal series, especially the second from the costa and the lowest, are also often absent, especially in the mountain specimens, but a greater degree of obsolescence is rare.

In the Brit. Mus. coll. is a specimen from Borjoni, from collection of Grum-Grshimailo, in which the obsolescence of the hindwing spotting is very marked, though the discal row is not entirely absent.\*

ζ. ab. *obsolata*, n. ab. [Hodgson, "Ent.," xli., p. 68 (1908), without description.] Specimens showing obsolescence of the spotting on both wings.

This form, differing from abs. *deleta* and *impunctata* in the fact that the spotting is not absent but only obsolescent, is, according to Hodgson, less uncommon than either of the two last described, at any rate in Britain. Beyond a combination of the slight obsolescence common in these two aberrations, the form is, we believe, extremely rare. Courvoisier (*Mitt. Schweiz. Gesells.*, xi., p. 19) mentions two specimens, both ♂, in which this tendency is carried to an unusual extent.

η. ab. *parvipuncta*, n. ab.—Specimens in which the spots are unusually small.

This is a common form of aberration, especially in specimens belonging to the *allous*, *semi-allous*, and *alpina* forms. The spots on the hindwing particularly are often minute.

θ. ab. *crassipuncta*, n. ab.—Specimens in which the spotting is unusually large.

This form is, according to Hodgson, less common in Britain than the last. It is, however, far from uncommon in the southern races, and is especially apt to recur in var. *cramera*. Hodgson notes that it is almost always produced by the enlargement of the black pupils at the expense of the white rings, and that, except in the case of a tendency towards striate forms, it is very rarely that these latter are noticeably enlarged.

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\* I have a large ♂ from Roccaraso, and a small one from Villalago, both in the Abbruzzi, in which only three and four spots of the discal row respectively are left.—(G. W.)

ι. *ab. discreta*, n. ab.—Specimens in which the discal row of spots on the forewing is moved outwards towards the orange lunules.

This is, in this species, a common form of aberration in all races and in both sexes. It is often very pronounced.

Zeller notes (*Ent. Mo. Mag.*, vi., p. 48) the capture of a small example in which the transverse rows of ocellated spots was placed so near the red fascia that on the anterior wings the innermost and on the posterior wings the 3rd, 4th and 6th were quite confluent with the black bordering of it.

κ. *ab. glomerata*, n. ab.—Specimens in which the discal row of spots on the forewing is crowded round the discal spot.

This is a much less usual form of aberration in this species than *ab. discreta*, but is not scarce. It is specially apt to occur in var. *nazira*.

λ. *ab. subtus-radiata*, Obth., "Études," xx., p. 24, pl. iv., fig. 51 (1896). *Radiata*, Obth., "Lép. Comp.," iv., p. 253 (1910); Courv., "Ent. Zeits.," xxiv., p. 126 (1910).—The wings strongly rayed with black bordered with clear white (Oberthür).

The rays are formed by the extension of the inner black edging of the orange lunules till they join the discal black spots, which are generally placed near them as in *ab. glomerata*. The specimen illustrated by Oberthür was taken in Auvergne. In the Brit. Mus. coll. are two specimens of this form, but all details are lacking, as is usual in the Mutzell coll., to which these specimens belong.

μ. *ab. elongata*, Courv., "Ent. Zeits.," xxiv., p. 112 (1910).—In which the eye-spots are drawn out into streaks or wedges (Courvoisier).

This form, in which some or all of the discal row of spots are elongated on the fore or hindwing or on both, differs from the previous *ab.* in the fact that there is no union of the discal spots with the inner edging of the lunules, the former being merely lengthened. Courvoisier reports two instances. Cases in which this occurs on both wings are rare, but those in which one or more of the discal row, especially on the forewing, are elongated are, on the other hand, very common. Any of the spots except the costal may be so elongated, but the extension of either part of the geminated spot at the anal angle of the forewing is very unusual. The spot most generally affected is that immediately above the double spot, and the elongation of the two above this is also quite common. The hindwing is more rarely affected, perhaps the spots just outside the two central ones of the row are those least rarely elongated.

A curious aberration combining the *elongata* form to some extent with the *postico-obsoleta* is described and figured by Weston (*Ent.*, xii., p. 185), in which the upper portion of the discal row is lengthened on the forewing, the lower spots also showing this tendency but being indistinct. The hindwing shows but few of the usual spots, but the first spot of the discal row is joined to the first of the basal row (*ab. costajuncta*, n. ab.). The ground-colour of this specimen is almost white. It was taken in Surrey in 1878 by Mr. W. B. Farr, and presented by him to the late Mr. Carrington.

γ. *ab. suffusa*, n. ab. *Astrarche ab.*, Pickett, "Ent. Rec.," xii., p. 272 (1900).—An aberration with the underside white with suffused black dots (Pickett).

The specimen described was taken at Folkestone in the latter half of August, 1900.

EGGLAYING.—The eggs are laid on the underside of the leaves of *Helianthemum vulgare*, to which they firmly adhere, in little groups of twos, threes, or more together (Buckler).—The egg is usually deposited on the underside of a leaf of *Helianthemum vulgare* (or *Erodium*), and in captivity several are in some cases laid side by side, though not actually in contact (Rayward).—The eggs are laid on the underside of the leaves of *Erodium cicutarium*, often several together, but scattered. In eight to ten days the larvæ emerge (Zeller, *Isis*, 1840, p. 126). After several attempts, which I made in the beginning of the summer of last year, to observe the ♀ whilst ovipositing, and which were always fruitless, through the weather, I at last succeeded on August 22nd. A ♀ settled on a fallow field on the bare ground. As I observed in her vicinity some young *Erodium* plant just developed from the seeds, I did not disturb her; consequently I saw how she approached towards one of these plants, and, after a short rest, curved her abdomen, and deposited an egg on the underside of a small leaf; having done this she flew away (Id., *Ent. Mo. Mag.*, iv., p. 73). On August 30th, 1906, I saw an *A. medon* lay an egg on Colley Hill, Reigate. She flew in little circles of a few inches to a foot in diameter, quietly, and examined several places; at last, when she got the right place, she made several attempts to find the exact spot by bending her body under a stem, and so on, but after several attempts succeeded in laying an egg to her satisfaction. The place she chose was where the *Helianthemum* was rather poor and trailing along the ground, and lying close to it, although vigorous plants standing up well were plentiful close by. The actual place on which the egg was laid was the underside of a leaf within a quarter of an inch of the soil. The egg hatched on September 4th (Chapman).

The ♀s, when ovipositing, behave in the usual manner of the *Lycenids*, first resting on a leaf, then moving about with their abdomen curved, and finally closing their wings with a jerk when they have found a suitable place for the ovum. I have previously stated (*Ent. Rec.*, xvii., p. 24), that the ova are chiefly deposited upon the rosette of leaves near the growing point of the rock-rose (*Helianthemum vulgare*). That observation was made in Scotland upon a bleak portion of the Fife coast, where the rock-rose was short and stunted. Having since spent a considerable amount of time observing the species upon the Durham coast, I have seen cause to modify my statement. In Durham, in the many sheltered denes cutting through the Magnesian Limestone, the rock-rose is of much freer growth, and there I have found quite as many ova upon the leaves near the base of the stem, as upon the leaves near the top. In July, this year (1906), I spent many hours searching for ova of *ab. salmacis*, and found several upon black knapweed (*Centaurea nigra*). When I proceeded to Scotland, in August, I particularly examined the same plant and succeeded in finding one ovum. Although in captivity the larvæ of *P. astrarche* feed readily enough on *Geranium sanguineum*, repeated searches on that plant have (with the exception of one ovum found in July, 1902) always ended in total failure. . . . The ova are laid singly upon the isolated plants of rock-rose. Large masses of the plant should be carefully avoided in searching for ova. Single plants, sheltered by a bush of any sort or by rocks, are the most favoured. . . . The larvæ emerge in from 6 to 15 days, depending on the temperature. They proceed from the



upperside of the leaf, upon which the egg was laid, to the underside, and feed there (Harrison). The last statement should be specially noted with regard to vars. *salmacis* and *artaxerxes*, all other writers, whose observations have been made on the less northern forms, speak of the eggs as laid on the underside of the leaf.

EGG.—Smaller than the egg of *P. aegon*, though very like it in form and sculpture. Circular, flattened, with a central depression on the upper surface, the shell covered with a coarse, prominent reticulation, gradually becoming finer towards the nearly smooth depression; its colour, a pale greenish-drab, continues to the last (Buckler).—The egg, when first laid, is of a beautiful pale green colour—resembling the shade of green in the imago of *Geometra vernaria*—but two days before hatching it changes to a uniform dull whitish hue (Rayward).—The egg (laid August 22nd) had the ordinary form of those of the genus *Lycaena*, was greenish-white, and retained this colour till August 31st, when it was white, and had above a large kidney-shaped hole, through which the larva had escaped (Zeller).—The egg is white, owing to the outer coat, but beneath this a green colouration (of egg contents) is very distinct (Chapman).

The egg is of the usual *Lycanid* shape, *i.e.*, flat top and bottom with rounded edges, like a cheese. It differs from the strictest pattern, by the bottom being distinctly wider than the top, by the top being very faintly convex, and its margins more rounded than are those of the base. The extreme width to the ends of the knobs or pillars is 0.50mm., the egg itself is smaller, smaller even than 0.45mm., which is the width to the bottom of the deepest hollow between the pillars that can be seen on the margins when the egg is viewed from above. The bottom (including adventitious coat), is about 0.42mm., the top about 0.38mm., the height (to top of pillars) is about 0.24mm. at edge, 0.26mm. at middle of top. The pillars at angles of network stand up above the hollows from 0.02mm. to perhaps as much as 0.03mm., where highest round the margin, towards the base they look broad, and compounded of several fused together; this may be an optical mistake, most have a slight summit expansion. The meshes of this network, towards and on the base of the egg, are hexagonal, but on the upper parts of the sides are usually quadrangular, with the sides oblique, formed by lines obliquely cutting each other, and about 0.045mm. on either side. (Described August 14th, 1907, from an egg laid at Cauterets, Pyrenees). The egg is of the usual *Plebeiid* form, but not quite so flat on the top as usual, even taking the tops of the white pillars it is still a little convex; still it is a flat top, in the sense that the sides do not run up into it as a regular dome, but curve rapidly into it, the upright side being less curved than at the margin and the top itself only slightly so. It has the usual white colour, green where the contents can be seen between the white ribs. It is 0.5mm. across, actually—not a round number at a guess, or 0.45mm., as nearly as one can see, is the diameter of the actual egg, apart from the white coating. The columns are tall, the cells for the most part square, with sides about 0.035mm. The ribs do not hang as it were in catenary curves from the summits of the columns, but from near their bases, and so the walls beneath them are comparatively short. The columns are in fact columns, standing out thick and high above the rest of the sculpturing. The slightly domed (not quite flat) top perhaps shows *Theclid* affinities (Chapman).

**HABITS OF LARVA.**—The newly-hatched larva (September 18th, 1877) is a very sluggish little creature, not inclined to leave the underside of the leaf, where it is hatched; they betray their whereabouts by the presence of small flesh-coloured spots which appear on the upper dark green surface of the leaves, the spots gradually increasing in size to blotches of irregular figure, and then turn to a rusty pale brown colour; and seen from beneath against the light they appear semitransparent and colourless, the tiny larvæ appearing as a dark object against the luminous blotch. By the end of October the lower cuticle of the leaves is often eaten away and the leaves turn brown, but the larvæ grow so slowly that in six weeks (November 3rd,) they are only 2mm., in length, and soon after this they take up their position on the underside of the leaves ready for hybernation. In early March the larvæ commence to feed again on the young shoots of the plant, seeking the tender leaves, eating a little from the underside of one leaf and then moving to another, and still betraying their whereabouts by the blotches made. Through April they feed up pretty rapidly, rarely staying to clear the whole underside of a leaf, and by the middle of May are full-fed. When moulting the old skin is left attached to the plant like an empty shell, not in the least shrivelled, but split open laterally along the ridge above the legs. When in its last instar the long whitish hairs closely resemble those of the underside of the food-plant and add much to the similarity of the larva to its surroundings, and making it specially difficult of detection; they appear to restrict themselves entirely to the underside of the leaves, to the colour and appearance of which they assimilate excellently (Tutt).

The larva hatches in from seven to nine days and escapes by eating a large hole in the crown of the egg, commencing about half-way between the micropyle and the outer margin; before emerging it has demolished about two-thirds of the upper surface including the greater part of the micropylar area. The time occupied in effecting the escape is often of considerable duration, and in one instance a larva which was observed to have perforated the top of the egg-shell on October 18th, at 7.30 a.m., did not leave the egg until some time during the following day, and at 8 a.m. on the second day was found to be resting from its labours, although the hole it had made was amply large enough to permit of egress.

Larvæ of this species hatched in September, 1907, fed during their first three stages exclusively on the cuticle of the underside of the leaves of *Helianthemum vulgare*, and were never observed resting in any position other than the underside of the leaves. The hibernating stage is, in my experience—one brood only—the third instar; the position, low down on the underside of leaves of foodplant.

The secretory gland on the 7th abdominal segment appears to be well developed in the third instar, and is probably first functional at this stage (Rayward).

The larvæ emerge in from six to fifteen days, depending upon the temperature. They proceed from the upperside of the leaf, on which the egg was laid, to the underside, and feed there. In that stage they are very difficult to see, as the short hairs assimilate closely to the white underside of the rock-rose leaves. In both Scotland and Durham they feed until well on in their second instar, when they retire for the winter and hide under leaves at the base of the stem. Even in

a hothouse they resolutely refuse to feed up the same year. They are very easy to hibernate in captivity. Early in the spring, towards the end of March and the beginning of April, they commence to feed on the new growth. They still feed on the lower side of the leaves, eating the spongy tissue from the lower side and leaving the epidermis. This turns yellow, and as the larvæ rarely eat more than the half of any one leaf before going to another, they are easily discovered by examining plants showing the characteristic yellow colour. When searching for larvæ, care is needed not to disturb the plants, as they drop very readily and are bad to find. Leaves eaten as above described, and the yellow showing a decidedly greenish tinge, always have a larva beneath (Harrison). The larvæ rest along the underside of the leaves of the foodplant, in which position they are very difficult to see, resembling the coloration of the leaves exactly. At rest their heads point towards the base of the leaf. They eat from the underside irregular patches almost through the leaf, and when doing this take up the opposite position, *viz.*, head to point of leaf, afterwards, when nearly fullfed, they eat the edges of the leaves also (Wood). The larva emerged from the egg (September 4th) by eating the whole top of the eggshell and some little of the sides in places, it then went to the other side of the leaf, which was too small a one to accommodate it on the same side with the eggshell, and ate a hole in the under cuticle, and then hollowed out a rather larger area of the central parenchyma of the leaf. It then went and served two other leaves in the same fashion, each excavation being of about the area of a millimetre circular. It is now (September 6th) resting under one of these leaves, which is the last opened one on the little shoot, and has its head and a segment or two buried in the terminal bud, the hole of entry being the stem of one of the two outer enclosing leaves; the bud is not above 1.5mm. long (Chapman). September 4th, 1907, I received two eggs from Mr. A. L. Rayward, one hatching; I placed the larva on a leaf of *Erodium*, two hours later it was seen to have eaten, and was voiding frass. The other egg had a dent in under surface, and contained a well-developed larva. The hatched one was emerging from side of egg, and so left a well-preserved upper surface. September 5th.—The larva has moved to another point of leaf, where it has eaten a small cavity, the place it has left is a cavity about as large as itself, with a minute hole only to other side of leaf. September 6th.—Larva has again moved, this is a proceeding observed also in *Rumicia phlaeas*, of use probably in not making too conspicuous a mark, or as leaving it as soon as it is conspicuous. The other egg was found hatched this morning, and the young larva placed at 8 a.m. on a leaf of *Erodium*; at 10 a.m. it was found to have eaten a small hole and to have voided frass. The newly hatched larva is nearly white, if anything bluish, with black dots of hair bases, conspicuous pale hairs, and a distinctly blue shade of prothorax, due to tinted scutellum and black head beneath shining through. This larva also came out at side and bottom of egg, the egg had a dent in it; both eggs had been removed from surface on which they had been laid, a circumstance that no doubt made the enclosed larvæ in some way doubtful as to their orientation (Id.). October 12th, 1907.—A larva of *astrarche* in second instar is noticed to-day to be entirely within its mine (in leaf of *Helianthemum*), which occupies nearly all one side of a

rather large leaf. This is the only time this has been observed, though several times a larva has been seen as far in the leaf as the 2nd abdominal segment. It is, however, exceptional rather than the rule for them to engage only the head and extensile neck (Id.).

The following account of the habits of the hybernated larva is from the pen of Prof. Zeller, and appeared in the course of an article published by him in the *Ent. Mo. Mag.* for September, 1867.—On February 14th I searched for the larvæ which had survived the winter in order to put them again in the sunshine. In the flower-pots which had been exposed to the open air I found both the plants and the larvæ were dead; in the third flower-pot I found fifteen larvæ of rather different sizes; they had sat motionless the whole time, either on the stems of grass, or on or under living leaves of *Erodium*. . . . Of the fifteen larvæ seven died by degrees. . . . Having planted three vigorous plants, the remaining larvæ prospered so well, that by April 8th, I could look upon them as quite, or almost quite, full-grown. They devoured the primate leaves—gnawed the stem of the leaf, hence causing the upper part to wither, and did not spare the young shoots, when the plants assumed at last a very injured appearance, and were abundantly sprinkled with grains of brown-green excrement. The larvæ crawl very slowly, whilst they spin a white thread, which they fasten to the right and left, and on which they place their legs. They are not easily perceptible on the food plant, since they are the same shade of green, and even their bristles have the same colour as the hairs on the leaf-stalk (Zeller).

ONTOGENY OF LARVA.—*First instar* (September 18th, 1877): Very minute with a glistening blackish head, stoutish body, of a light drab-green colour, velvety and hairy. *Eight days old*: Its size is now doubled. *One month old*: Of the usual Lycænid shape, 2mm. in length, thick in proportion, with small retractile head, the body of a dull pinkish-brown colour, with darker dorsal stripe and rather hairy. *After hibernation* (early in March): Of a dingy slaty-green colour; it moults in early March. *Penultimate instar*: Quite pale green on the back, broadly pinkish along the lateral ridge and still hairy. In early April it is about 3mm. in length, of greenish flesh-colour, palest on the prothorax and dorsal eminences, pinkish in the dorsal hollow, and also beneath the spiracular region, the long whitish hairs closely resembling those of the foodplant. Final moult took place on April 21st. *Final instar*: About 12mm. in early May when full grown. Like that of *artaxerxes* except that the green colour is more lively and full, and the pink along the lateral region is darker, inclining to purplish. *Final instar of var. artaxerxes* (May, 1868): About 8mm. long on May 8th, becoming 12mm. long by May 18th. At the earlier date pale green in colour, clothed with very fine and short whitish bristles. Of the usual Lycænid shape, short and thick, arched on the back, down which are two rows of rather peaked cone-like eminences, with a dorsal hollow between them; the prothorax simply rounded above, and rather longer than the others, tapering a little near the head, which is very small and retractile; the anal segment tapers very little, is rounded behind and hollowed above on the sides, the 8th abdominal has a small but prominent wart on each side. The dorsal line beginning on the metathorax and ending on the 8th abdominal is faint brown in colour, wider and more strongly marked just at the





*Photo. F. N. Clark.*

A. MEDON, SKIN OF FIRST LARVAL INSTAR  $\times 68$ .

beginning of each segment and widest at its termination on the penultimate; on the sides of the 1st to the 6th abdominal segments are double oblique lines slanting backwards and downwards, of paler green in front and darker green behind than that of the ground-colour. At this stage of growth the lateral projecting ridge of swellings broadly pink, with scarcely an indication of a central paler stripe; the belly and ventral prolegs pale yellowish-green; the true legs flesh-colour; the head black, the base of the papillæ flesh-colour and a streak of the same above the mouth. On approaching full growth the oblique stripes gradually disappear, the green colour becomes rather darker; a pinkish-white stripe runs along the lateral prominences, broadly bordered above by a stripe of rose-pink, and beneath by a broader stripe of still darker pink. The spiracles are flesh-colour, situated in the upper pink stripe, very minute and inconspicuous. The ventral prolegs green, the true legs pinkish, spotted with brown (Buckler).

The following is the larval ontogeny as worked out by Chapman:—*First instar*.—September 6th, the little larva hatched September 4th, has now grown a little but barely exceeds a millimetre in length. It is greenish-grey in colour, well matching the whitish undersides of the *Helianthemum* leaves, and has a number of black dots, which are hair bases, lenticles and spiracles. The abdominal segments carry i, a long curved hair, spiculated, pale, with a black base; ii, a shorter hair similarly curved, two large lenticles; iii, with a straight hair, directed outwards and a little forwards; the spiracle, and three marginal hairs in a row, diverging, the middle one longest. This description is correct for dorsal portions of 6th abdominal, but those in front differ; the upper lenticle of the 6th, which is posterior to the other, is represented by a small spot, but the upper lenticle corresponds to the lower one of 6th, and has below and behind it another, and below this and behind iii, is a small dot, apparently a hair; the 7th has a lenticle in place of ii, and no others; the 8th has above spiracle only i, and a lenticle (ii?).

A description from another larva; (several descriptions of these difficult little mites are not undesirable). The larva when hatched is a very small scrap of nearly colourless tissue. When full-fed, its utmost stretch is barely 2mm., body pale ochreous, head and legs black, or legs a little less dark, head 0.2mm. wide, with a few fine hairs. Neck can be stretched to 0.35mm., between head to first skinpoints of prothorax. Skinpoints are numerous, fine and sharp, but very palely tinted. The hairs and lenticles are very nearly in the arrangement usual in first instar Lycænids. The chief point of special difference is that instead of the two hairs above the abdominal spiracles (iii?) being both very small, the front one is a large well-developed hair, quite equal to ii in size and length, the other is small, and in one specimen, is wanting on one side in abdominal segments, 1, 2, 6 and 7, and on the other in 4, 5, 6, 7. Both are absent (as usual) on 8th.

The prothoracic plate (about 0.14mm. across) has a pair of large lenticles on the front margin with a pair of minute hairs between them, behind them and closer together are a pair of long hairs (0.2mm. long), a similar pair further back and wider apart, and a small hair towards the outer angle. There are three hairs about 0.13mm. long (on either side) in line transversely, in front of plate; a rather larger one in line with these



further out. Two rather shorter below and in front of this, and two fine hairs (not more than 0.1mm.) at base of legs, there is a small lenticle a little way in front of spiracle. On the mesothorax are (on each side) two hairs towards the hind margin, being like the i and ii of following segments; in the front of the segment, dorsally, are two very big hairs on each side (nearly 0.3mm. long) with a lenticle between them. Between these dorsal hairs and the two small ones at base of legs are five hairs (about 0.13mm.) representing the circumspiracular set (iii, iv, v). Metathorax has i and ii and a large lenticle below them just like the abdominal segments, a long hair (0.16mm.) in line with iii (?) of following segments, three hairs just like the subspiracular (flange) set of the abdominal segments, and the two fine hairs at base of legs.

First abdominal is the same as this, except that it has (on one side, as has already been noted) a small hair behind iii (?) and a second lenticle just below the upper one and above (and between) these two hairs. There is only one hair corresponding to the two at base of legs on thorax, there are also two minute ventral hairs. The further abdominal segments are the same, except that the hairs at base of legs are two on 3rd, 4th, 5th, and 6th segments, and that there is a lenticle just above them on 2nd and 6th. i is a very big and strong hair (0.3mm., or nearly), curved in a backward sweep and giving the special crested appearance to the larva; ii is a short hair (hardly above 0.1mm.) just behind and outside it. Accessory iii is very short (0.04mm., or less), curved and blunt, almost clubbed, quite different in character from the other hairs; (in many *Lycænids* both these hairs are of this character); 7th abdominal appears to be without the sub-dorsal lenticles, but has one in place of ii; (of course, ii may be wanting, and this lenticle one of the sub-dorsal ones pushed up); 8th has a long dorsal hair and a lenticle at its base, in front of and outside it. The anal plate is small (0.06mm. across), with a minute point towards either side like an obsolete hair-base. As marginal hairs behind 8th segment are (on each side) seven hairs, of which three are long ones. The anal margin has very strong sharp skin points. Many of the lenticles are much larger than the spiracles, those, for example, on dorsum of 7th abdominal are twice the diameter of the spiracles. The spiracles are noteworthy as having four rays or processes equally spaced, on their outer margins, nearly a fourth of the diameter of the spiracle in length. *Second instar*: The larva is still a pale greyish scrap, with bluish prothorax, largely due to black head included. The hairs are less long in proportion but more numerous. Seen from above, the larva is widest at thorax, and diminishes in a regular conical manner to last segment, where it is rounded, the width at 8th segment being about half that of the thorax. There is a darker dorsal line (vessel), and the lateral flanges stand out whiter, whilst there are some intermediate markings as of a faint brown shading—length barely 2mm. September 23rd.—Laid up for 2nd moult; length 2.3mm.; faintly yellowish-green, nearly white; darker tone of prothorax barely noticeable, faintly darker dorsal line and paler lateral one. Spiracle small, nearly black, a number of black points (hair bases) on slopes, dorsal crest of hairs still marked, as well as lateral fringe; has spun a very definite carpet for moulting on. There is faintly discernible a paler dorsal line on flanges on either side



Photo. F. N. Clark.

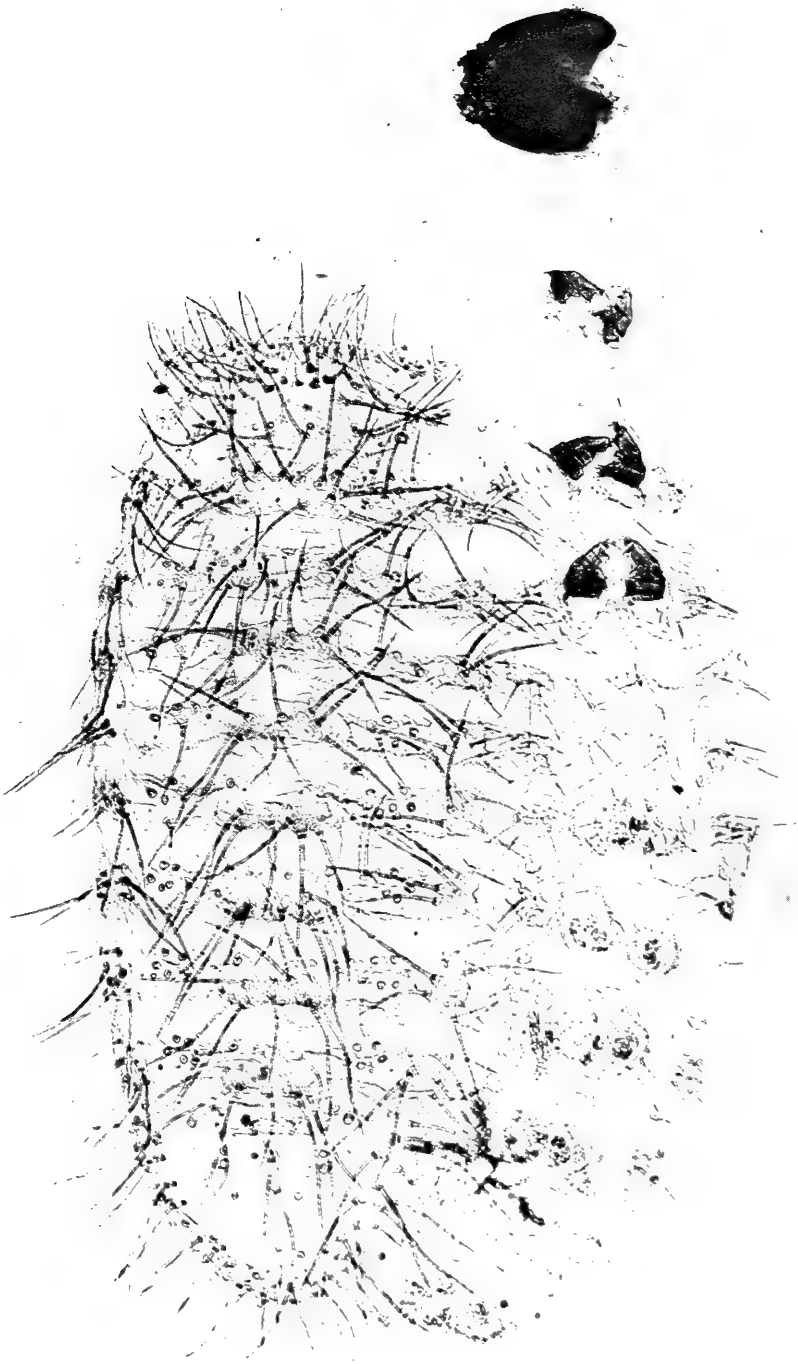
A. MEDON, SKIN OF SECOND LARVAL INSTAR  $\times 40$ .

*Natural History of the British Butterflies, etc., 1912.*

[To face p. 266.]







*Photo. F. N. Clark.*

A. MEDON, SKIN OF THIRD LARVAL INSTAR  $\times 30$ .

of darker dorsal line and a depression near spiracle with surrounding rampart. September 26th.—Has moulted this morning, had not done so last night, the long resting period is remarkable, the weather having been the warmest of the year, about  $65^{\circ}$  average, in room where larva is. In the second instar the hairs are long and well but finely spiculated; on the 7th segment the honey-gland replaces dorsal hairs, though there are two in front of it, that may be i, but are probably the accessory pair in front of i, but iii is a well-developed hair nearly as long as i. The condition in third instar is the same except that iii (on 7th abdominal) is represented by two hairs. There are five instars, but my notes and specimens of the fourth are very deficient. My specimens, however, suffice to show, by the sizes of the heads, that there are five instars. In the last instar the special angular hair of the prothorax has a dark base with a beautifully crenulated margin, and the radially arranged skin points about it complete—an elegant object when properly magnified. The “fan” or scent gland is well developed, each hair of this seems to terminate in a flat disc slightly larger across than the thickness of the hair, and with a central aperture, or almost a trumpet-like extremity. The honey-gland has the usual four circles with four accessories, centrally within it (tubercles i and ii modified?). It is surrounded by a fairly complete row of lenticles, and has also some half-dozen short hairs (about 0.1mm. long) whose terminal halves form quite a brush of fine long spicules. There are other short hairs, clubbed, bent, and clothed with short spicules. The lenticles, which also are frequent near the spiracle, are often quite circular with broad smooth borders, but others are variously angulated (representing the spines on hair basis), even exactly triangular, or square, or intermediate, with several (to six or eight) little knobs on the margin. The hairs are usually pointed, the smaller ones often markedly curved, and all spiculated. The bases are sometimes smooth, usually so on the front segments, and vary to a stellate structure, which is more usual on the posterior segments, where some very marked forms occur. Each pad of the prolegs has about five large and five small hooks alternating. In the first instar there is a large and a small, occasionally a large and two small. In the second are still only two. In the third instar sometimes two hooks sometimes three, one larger than the other. In the fourth they vary from two large and a small to three large and two small. The head is always black. But one might fill many pages with these structural details of the larvæ, and must be satisfied with leaving further details to be gathered from the photographs (Chapman).—*Larva before and after hibernation*.—A well, or full-grown larva in third instar on *Erodium cicutarium*, October 3rd, 1907, 4mm. long, probably more if extended; 1.5mm. at thickest, about 1st abdominal, on dorsal view, narrows slightly and gradually to 7th abdominal (about 1.2mm. across), thence rounded. Each segment presents a marked rounded prominence on either side in the line of the dorsal flanges, making a dorsal groove between them; these project well over prothorax, in a way approaching *Strymon*, incision well marked both across back and along lateral flange. The colouring makes the insect from above seem very flat, and the lateral flange does project a little laterally, *i.e.*, the flange projects cutwards from the bottom of the “slope” with a re-entering angle; but the larva is really nearly as high as broad. Colour a pale

dull green, darker on dorsal line, paler along dorsal flanges, in a narrow oblique line on slope, and another about spiracle. The lateral flange is broadly red, a pinkish flesh colour, tending to brick red at margin, where it adjoins slope above, and ventral surface below. Each dorsal hump has three or four largish dark (not black) hairs, these hairs are in the line of iii, and the flange carries a sparse fringe of long pale hairs, the largest about 0.3mm., paler ventrally. October 6th, 1907.—This specimen has moulted since yesterday, for the third time, and is now in fourth instar—green with reddish border and hairs, green head with reddish jaws and black eyespots; very hairy—may no doubt be more advantageously examined when it has grown somewhat. October 15th.—Has been feeding well since last entry, it is now bunched up on a leaf stalk and is probably thinking of an approaching moult. It is 4.5mm. long, and 2.5mm. wide, and 2mm. high. It is deep apple-green, with slightly darker dorsal line, and red or pinkish-brown broadly along the lateral flange and some way below it. The humps of dorsal flange are very prominent, and the slope has on each segment a hollow below this hump and another above the spiracle, not quite united, but giving the segment the appearance of having the margin raised, the two margins curving round and meeting below spiracle, above lateral flange. The latter is prominent, and makes about the difference between height and width. There are two pale oblique lines on each segment between the two hollows; it is difficult to say how far they look more evident owing to reflections of light from the curved surfaces. The hairs, finely spiculated, are very numerous, about 0.6mm. long laterally, a little less dorsally, and shorter elsewhere; they are colourless or slightly ruddy, and their bases are quite smooth. There is a patch in centre of dorsum of the 7th abdominal segment, surrounded by a ring of minute dark lenticles, a central slit is not clearly seen, the post-spiracular glands on eight appear to be present, a pale patch of different skin-surface being visible. The spiracles are on short columns. (Of the second lot, now October 15th, about to undergo second moult [one just moulted], four are dead, simply died resting on leaf, with no definite cause observable. These larvæ did not eat their cast skins—is this the cause of weakness?). October 31st, 1907.—The first specimen (on *Erodium*) has now been some ten days lethargic and contracted on a silk pad on the glass, full-grown in 4th instar, 5mm. long, 2mm. broad, apparently means hibernating. The second batch are now apparently resting for third moult; they are very short (2.5mm) and broad (1.3mm), green with reddish margin and distinct whitish oblique lines on "slope," two in each segment. February 22nd, 1908.—Found a larva of *medon* beneath a leaf of *Helianthemum* on a potted plant; several leaves about had been eaten, but at what date may be doubtful. Another one, in a glass tube, without anything but a bit of blotting paper, kept in cellar all the winter, has much the same appearance as the one on the plant. Others in tubes with bits of plant were dead and mouldy. The living larvæ are of a bluish green with red dorsal stripe and the flange broadly and brightly red. The hairs of the crests and flanges are long. Length nearly 4mm. March 14th, 1908.—The two larvæ are going on well in test tubes, one has just moulted to its last skin, the other is laid up. In colouring they are identical, a fine apple green, with narrow reddish dorsal line





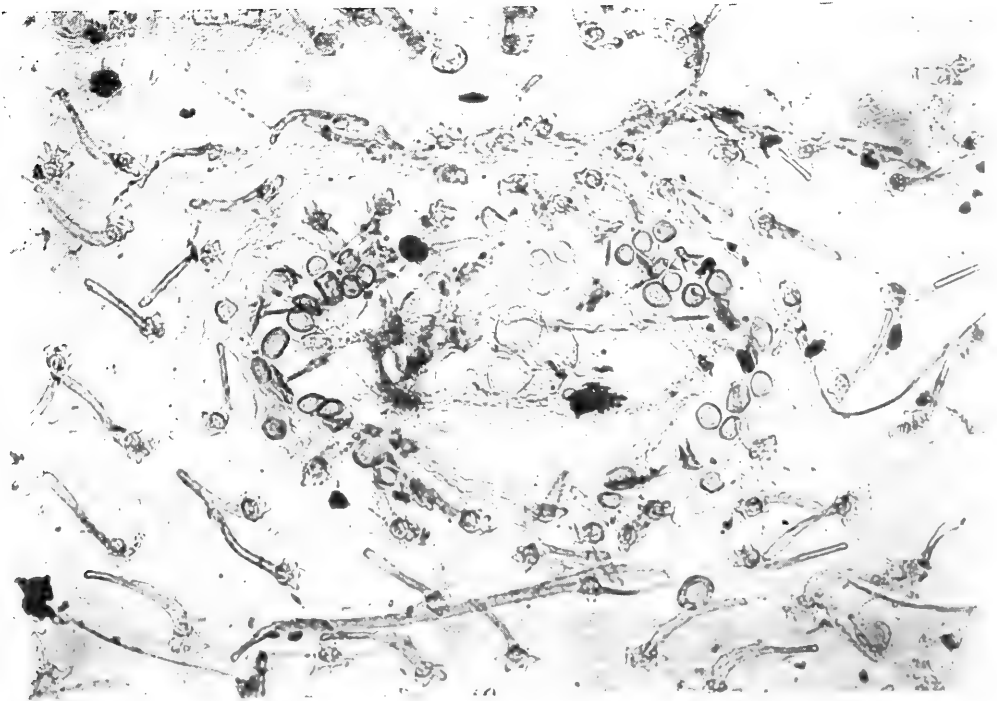
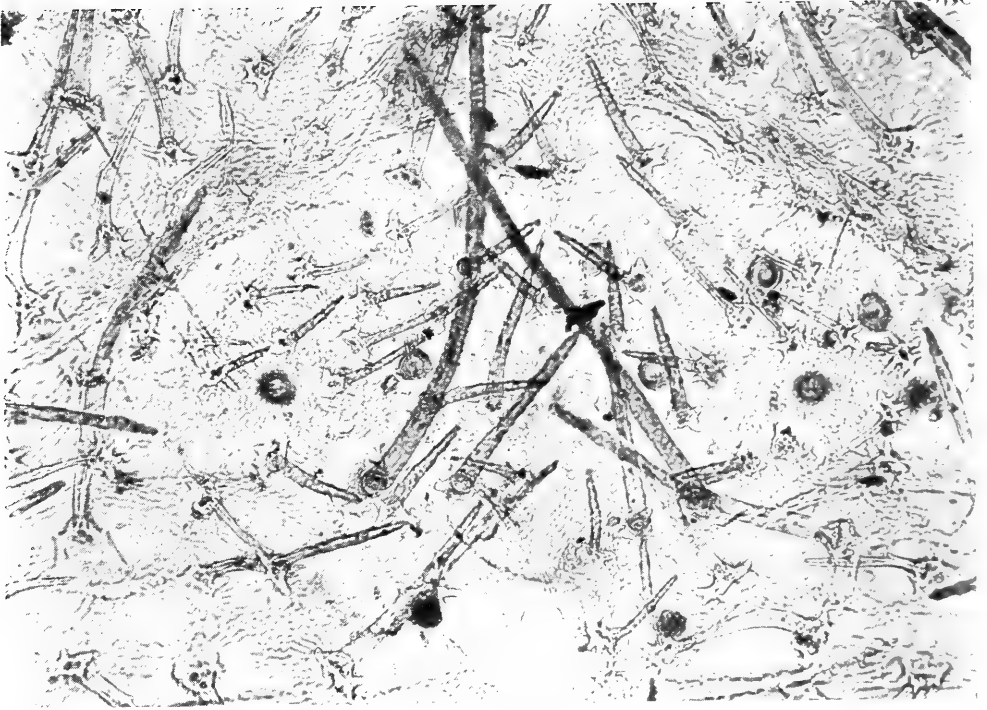


Photo. F. N. Clark

A. MEDON, LARVAL SKIN.

1. PROTHORACIC PLATE, LAST INSTAR  $\times 100$ .
2. REGION OF HONEY GLAND  $\times 100$ .

and bright red lateral flange line, all three fading out at the ends. They differ little in size, but the contrast is rather great, the one in 4th (3rd ?) instar looks fat, distended, bare, and hairless; it is 5.5mm. long, 2mm. broad, and 2 mm. high, highest at 1st abdominal segment, dorsal surface of prothorax nearly vertical facing front, — from lateral view, incisions deep, and segments rounded from mesothorax to 6th abdominal, remainder tapering more rapidly; end of larva is nearly 0.5mm. beyond claspers. The end view shows a dorsal plain, slopes flat, except for a slight rise half-way down; the lateral flange (at middle of larva)  $\frac{2}{5}$  height of larva from base, below this the sides slope in to prolegs. The lateral flange is so full and rounded as to have an angle or groove above and below it. The hairs are faintly rufescent, but on the distended larva, very inconspicuous from being thus scattered. The other larva that has just moulted looks very hairy, so much so that one would have to make allowances for the obscuring effect of the covering to make out the exact form of the larva. The hairs appear to be colourless, and in sunlight form a dense shining cloud along the dorsal and lateral flanges, where they are longest if not most dense. The length is about 6mm. The larvæ eat by preference the young leaves at the end of a growing shoot, and finish them so that there is only rarely the appearance, so common earlier, of white spots of cuticle, whence the parenchyma has been eaten away below. March 28th.—A larva, not full grown, but in last skin, when sulky and drawn together, is 9.5mm long, 4.2mm. high, and 4.6mm wide. It is thickest at 1st abdominal segment, diminishing rapidly forwards with each segment, only slightly backwards to the 6th abdominal, where it is nearly as wide, but only half as high, as the 1st; thence it dwindles in a conical manner; dorsally the first six abdominal segments (seen laterally) are semicircles, the remainder, 7-10, slope regularly; the thoracic segments are flatter, the mesothorax has only a little of the lapping over the prothorax, so strongly seen in *Callophrys rubi*. There is a dorsal furrow, the dorsal flanges are about 1mm. apart, the "slopes" are flat, i.e., as seen from back or front they present a straight line. The lateral flange stands out angularly, and the line of tubercle vi does so slightly, an effect much increased by, possibly entirely due to, the strong line of hairs at that margin. The larva is a very beautiful one, the rich rose-pink of the lateral flange contrasting with the pale apple-green of the rest of the larva, all, that is, except the dorsal furrow which is purplish. These colour contrasts are further much enhanced in effect by the haze of pale, darker than silvery, less tinted than golden, hairs, which are especially massed along the dorsal and lateral flanges and the line of vi, and less along iii. The actual skin seems to be polished and reflects the light, especially if bright, with remarkable effects, showing silvery lines down the posterior border of the segments, a brilliant silvery line along the lateral flange, sometimes with branches descending lower, and often with a row of brilliant white dots on the eminences of the flange at vi. All this is complicated by the difficulty of saying where the colours really are, the actual skin, and layer immediately beneath, being clear and crystalline. The lower surface has the green washed with ochreous, but so as hardly to amount to olive. In bright sunshine the hair-bases over the whole larva sparkle like minute gems. Another specimen shows a white lateral line, not that this simple statement

describes it, it is really a line of very pale pink down the middle of the darker pink lateral line, and having all the appearance of, and probably actually being, a thread of white tissue imbedded in the pink material, just as the latter is sunk some way beneath the actual skin surface. The same specimen shows distinctly yellow oblique lines down the slope. These also are not skin marking, but are slightly irregular threads of yellow matter, taking a greenish hue from overlying fluids, because sunk to some depth beneath the skin. Each oblique line beginning at a dorsal prominence passes obliquely backwards and downwards, crossing the next two segments, the first high up, the second above the spiracle, and ending on the fourth by being lost in a yellowish upper border of the lateral pink mass. Owing to their being rather obscure at either end of the larva, due to the colouring matter being buried, it is difficult to say on what segments these oblique lines begin and end, they are, however, tolerably evident on the 2nd and 3rd thoracic and 1st-6th abdominal segments. June 16th, 1908.—Larva of *medon* (*salmacis* ?) from Middlesbrough. Has no dorsal red line and only the faintest indication of a dorsal difference of colour from that of the larva. The lateral line is less marked than in the larvæ noted earlier (from South of England), so far as memory is reliable, the colour also is less brick-red, more pink, but this is probably due to larva being quite mature and beginning to think of pupation, though it is still active and unchanged in form. On mounting this specimen it is found to contain nine hymenopterous (chalcid ?) larvæ (Chapman). The full-grown larva has a length of  $6\frac{1}{2}$ -7 lines. Its body is much arched, and so contractile that the creature can appear  $1\frac{1}{2}$  lines shorter, whereby it naturally becomes much more deeply arched. The much concealed black head has a whitish transverse streak above the mouth; the dark palpi are whitish at the base. The ground-colour of the body is an agreeable pale green; the deeply-seated, brownish-purple coloured dorsal line reaches from the beginning of the mesothorax to the beginning of the penultimate segment; the rather flat anal plate is semi-oval, and in the middle of each side slightly concave. On each side of the body, from above obliquely downwards and posteriorly, go faint pale stripes, only just perceptible, and in many points of view quite invisible. The incisions of the segments are deep above, whereby on each segment near the dorsal line an eminence arises, which bears a multitude of white bristles of unequal length, almost radiating. Below this wart-like eminence is a second less conspicuous, with similiar bristles. Both eminences have hollows in the middle, which the larva can raise or depress at will. The lateral wart, clothed with longer projecting bristles, in which the spiracle is not perceptible, is purple-red, and forms the rather broad lateral stripe, which, however, does not reach the head, since the prothorax is either altogether green at the sides, or is only pale reddish posteriorly. The anal plate is purple-coloured only for a narrow space anteriorly at the sides. The belly is pale green with many whitish bristles. The ventral legs are short, pale yellowish, rather transparent, with short cylindrical feet, with a darker yellowish circlet of hooks; the pectoral legs are spotted with black anteriorly (Zeller).

SYMBIOSIS OF ANTS WITH THE LARVA OF *A. MEDON*.—The following note on this subject is interesting, though the author was unaware of the existence of the honey-gland and its use:—My next observation



EXPLANATION OF PLATE XXV.

*(To be bound facing Plate XXV.)*

Fig. 1. Head of pupa (case)  $\times 20$ , the sculpturing, hairs, &c., are well shown. The glazed eyes are very dark. The antenna, legs, and proboscis cases are without hairs.

Fig. 2. Pupal prothorax  $\times 40$ , showing hairs, sculpturing, lenticles, &c. The portion in front is the dorsal head-piece, the thoracic spiracle and its cover is attached to the mesothorax below.

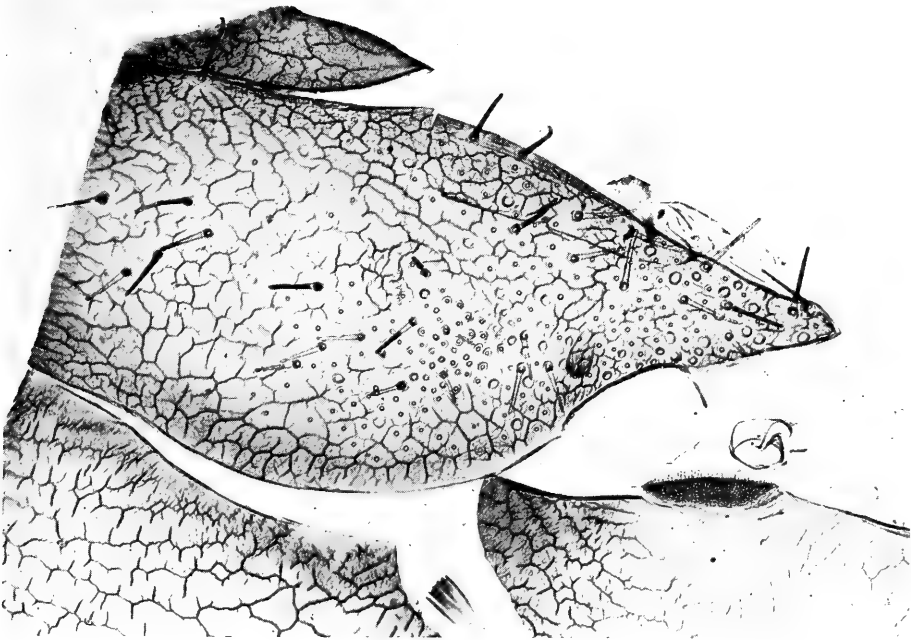


Photo. F. N. Clark.

A. MEDON, PUPA. HEAD  $\times 20$ , PROTHORAX  $\times 40$ .





is, I think, absolutely new for the species. I may say with a fair amount of certainty, that I have found as many larvæ of this insect wild as anyone, and I have always found them attended by ants. . . . I found an almost full-grown larva in May, with two ants upon its back. They seemed to be moving their antennæ up and down on the back of the larva. Leaning too far forward, I disturbed the larva, which dropped, and with it dropped the ants. That this contact with ants is essential for the well-being of the larvæ up to a certain point, seems certain. We had larvæ reared *ab ovo*, at exactly the same stage as wild larvæ discovered soon after leaving their hybernacula in April, 1905. Ants were purposely kept beside the latter, and away from the majority of the former. A few of the former were also introduced near the ants. The wild larvæ (from *ab. salmacis*) and those from *artaxerxes* kept in contact with the ants proceeded very satisfactorily. Those reared away from the ants, remained small and always looked unhealthy. In the end they died before pupating (Harrison).

FOODPLANTS.—*Helianthemum vulgare* (Buckler), *Erodium cicutarium* (Zeller, etc.), scarlet geranium [*Pelargonium*], in preference to *Helianthemum* when provided with both (Wilson). In captivity, the larvæ feed well on any species of *Helianthemum*, any species of *Pelargonium*, any species of *Geranium*, and upon *Erodium*. They specially delight in half-decayed leaves of the zonal pelargoniums of the greenhouse. If removed from any one food plant to another, they feed without any hesitation upon the substitute (Harrison). [*Trifolium* (Favre) suggested also as a possible foodplant by Höfner, together with *Cytisus*, *Lotus*, *Anthyllis*, and other *Papilionaceæ*, though foodplants of several Lycænids, require confirmation.]

PARASITES.—*Apanteles astrarches*, Marsh (Bignell); *Microgaster* sp. (Logan). Large larvæ at the beginning of the spring generally produce seven or eight cocoons of one of the larger species of *Microgaster* (Harrison). One larva was found to contain nine hymenopterous (? chalcid) larvæ (Chapman).

PUPARIUM.—Towards the end of May the fullfed larva spins about the stems of *Helianthemum* a few silk threads, near the ground. It then spins a silken web on which to rest, and then a silken cincture, which passes round the metathorax, and thus attached it rests in a nearly perpendicular position, and so undergoes pupation (Tutt). In captivity, however, the methods of pupation are far from being uniform, as is shown by the following accounts:—When the time of pupation approaches the larva becomes of a paler green, and creeps about restlessly, in order to seek a place for spinning. I laid crumpled paper, gauze, dry elm and poplar leaves, and old *Artemisia* stems, amongst the *Erodium* plants. As, however, with the larvæ which first became restless all this appeared of no avail, I shut up the two most bleached and shrunk in a small wooden box, in which both gauze and paper lay. Here they changed after five or six days (since eventually they merely sat still) to pupæ without spinning. The others in the flower-pot changed on the earth, nearly free. I had almost come to the conclusion that spinning in *medon* is altogether omitted; however, two spun up quite in the usual *Lycaena* style, on a white silken web, and with a thread round the body; one of these was in the cavity of an old elm leaf, the other on a willow leaf between stems of *Artemisia*, which it had drawn together with some transverse threads, forming as

it were the rudiments of a cocoon (Zeller). Some pupated in moss but failed to emerge. Others spun up in the usual *Lycænid* style upon a muslin sleeve and emerged safely. Some we kept, pupated loosely on the surface of the ground and yielded their imagines safely. Most, however, pupate on the leaves and stem-bases in the style of *P. icarus* (Harrison). Chapman gives (*in litt.*) the following note: April 3rd.—One larva has laid up for pupation, it has made a few strands of silk by way of cocoon and a few others (four or five only) lie across the 3rd thoracic segment by way of a girth (Chapman).

PUPA.—About 8mm. in length, smooth and without polish, rather thick in proportion, the head rounded and prominent, the thorax rounded above, the abdomen plump and curved a little backwards, its anal extremity hidden by the shrivelled larval skin which adheres to it. The colour of the head, thorax, and wingcases blue-green, a black curved streak obliquely placed on each side of the head; the abdomen yellowish flesh-colour, a deep pink stripe at the sides enclosing a central white one, which can also be seen showing through part of the wing-covers. (Described from a pupa of the var. *artaxerxes*.) The pupa has the usual *Lycaena* form, is 4.5 lines long, the males small and more slender than the females, naked only at the head and on the upper part of the back, with isolated very short whitish bristles, only perceptible by the aid of a lens; the colour is a rather transparent pale amber, more or less greenish, with slight lustre, the opaque abdomen is more of a pale yellow. Over the eye is a short, curved, shining black line. The convex thorax is separated from the equally convex back of the abdomen by a saddle-like depression. The abdomen has along the back a longitudinal line of reddish-purple, more or less brilliant, and a similar lateral stripe of different breadth, which also shines through the upper margin of the wing-cover. The anal end, which is concealed in the empty larva-skin, is bluntly rounded, and without spines or bristles. It is immovable, and is held fast by a fine white thread, which is drawn round the commencement of the abdomen, and by the exuvia, on its silken couch. The exclusion of the imago takes place according to the temperature, in from two to three weeks (Zeller). April 8th.—Pupated some time yesterday, but has already acquired a somewhat solid appearance, though the tracheæ of the wings are still very plain. The head, thorax, and appendages are a dark olive green, the abdomen is an ochreous or yellow, with a mere shade of green, along the abdominal segment is a pink-red dorsal line and a similarly coloured lateral one, very bright rosy pink. This lateral colour shines through the as yet rather transparent wings, where they cover it on the forward abdominal segments. A notable feature of the pupa is the very dark colour of the eyes, suggesting a pupa preparing for emergence rather than one newly changed; there are also some dark marks, not of the skin, but more deeply situated, about the wing origins and the prothorax just in front; a thread or two representing a girth crosses over between 1st and 2nd abdominal segment and a single thread a little further back, and another over the front of the mesothorax. The anal extremity reposes in the cast skin. There are some short scattered hairs except on the appendages. There is rather a wide margin beyond Poulton's line. The pupa lies flat on the surface of attachment, from opposite the pro-mesothoracic incision to the 3rd-4th abdominal incision. In



EXPLANATION OF PLATE XXVI.

*(To be bound facing Plate XXVI.)*

Fig. 1. Spiracular region of fifth abdominal segment of pupa, to the left is a "puckered area" corresponding to the depressed ("upholstered") portion of the "slope" in the larva.

Fig. 2. A portion of the cremastral area  $\times 100$ . There are hairs and a few rosettes, but no cremastral hooks.

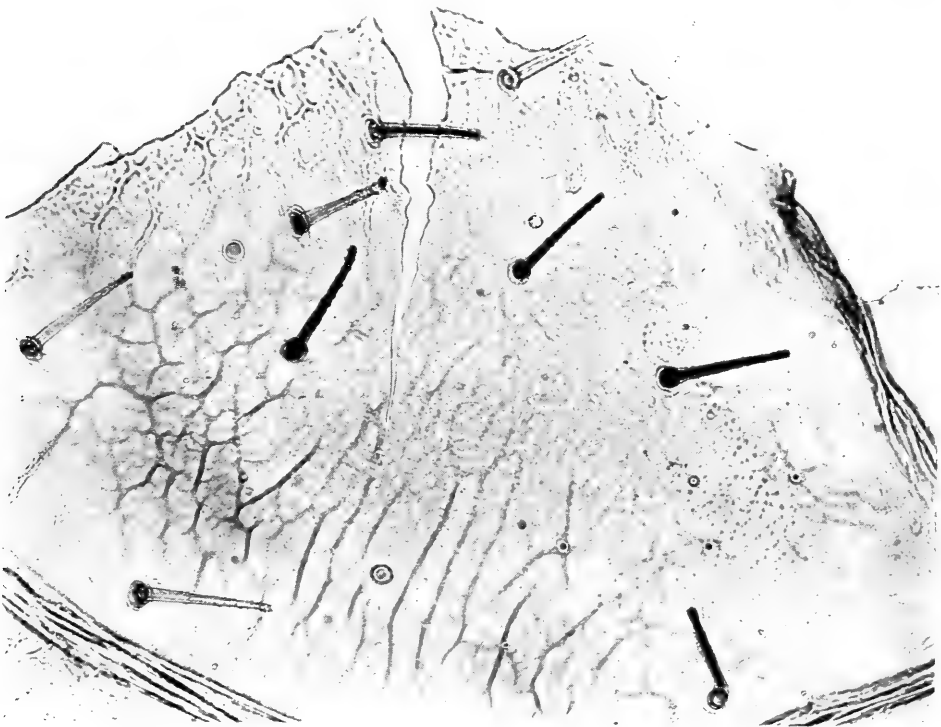
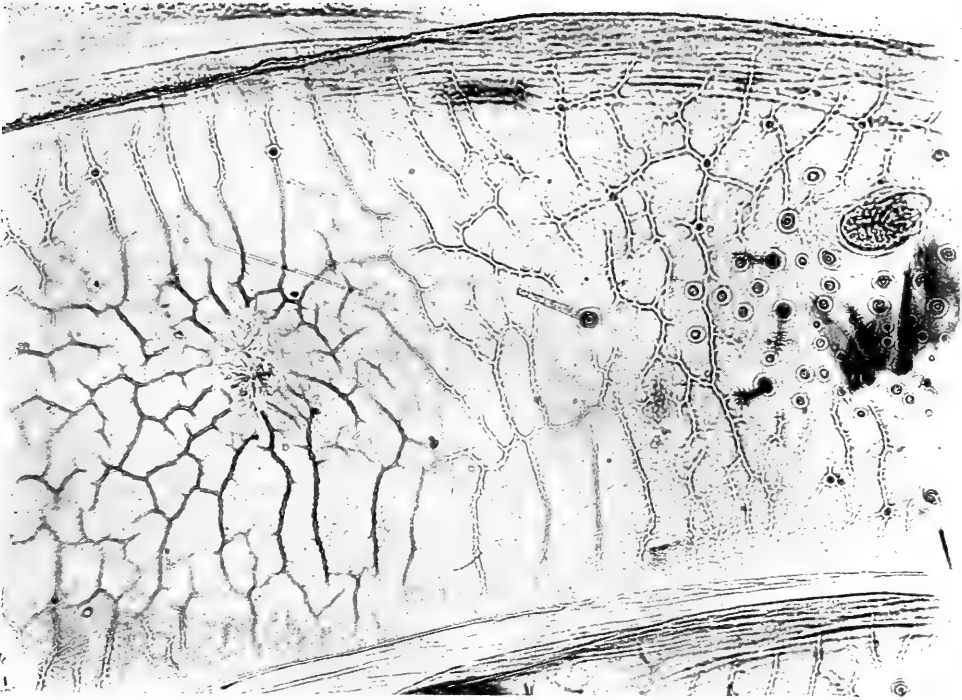
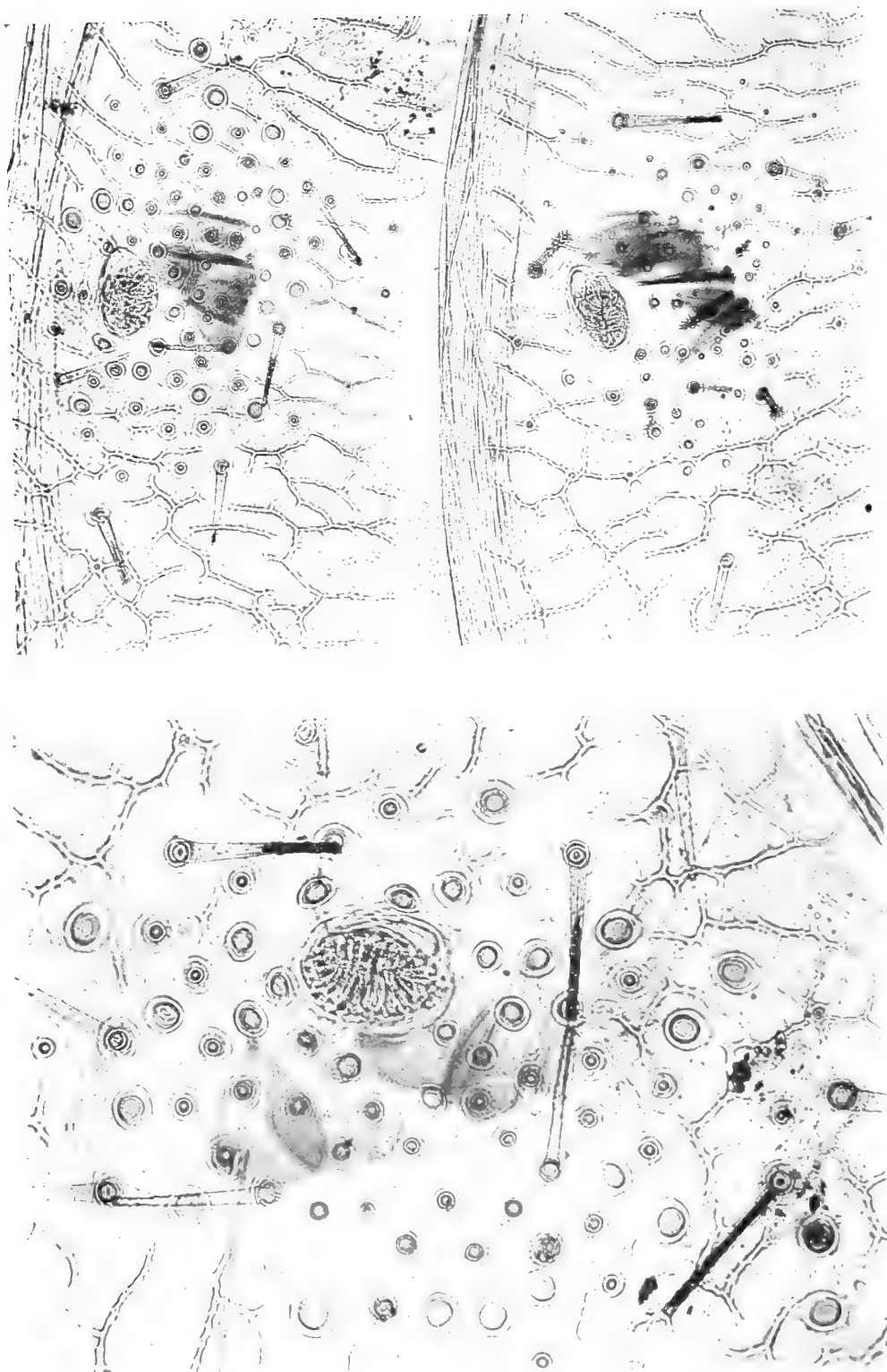


Photo. F. N. Clark.

A. MEDON, PUPA. PUCKERED AREA ABOVE SPIRACLE (5TH SEGMENT)  $\times 75$ .  
CREMASTRAL AREA  $\times 100$ .







*Photo. F. N. Clark.*

A. MEDON, PUPA. SPIRACULAR REGION 5TH AND 6TH  $\times 75$ .  
3RD  $\times 100$ .



EXPLANATION OF PLATE XXVII.

(*To be bound facing Plate XXVII.*)

Fig. 1. Spiracular area of 5th and 6th abdominal segment  $\times 75$ . To the left are various spiculate hairs, not very different from the "fungus" hairs of Chrysophanids.

Fig. 2. Third abdominal spiracle  $\times 150$ , shows the abundant lenticles, and how these and the hairs are not in line with the reticulations, whilst the "rosettes" are at the angles of the reticulations, there are only one or two rosettes in this figure; there are more in Fig. 1.



front of this the head and prothorax form a nearly hemispherical projection, about 2.5mm. high at 1st-2nd thoracic incision. This is a re-entrant angle, beyond which the mesothorax rises in a dome to 3.4mm. high, 2.5mm. from front, then after a slight hollow to 3mm. at thoracic-abdominal incision, 3.8mm. from the front; it rises again to about 3.2mm. along abdominal 2nd, 3rd, and 4th, and then curves down to the end. Posteriorly from 3rd-4th incision 5.5mm. from front, the ventral line leaves the surface of attachment, so that the apex is about 1.5mm. above it. There seems to be no trace of cremaster. April 17th.

—The fairly mature pupa is much as already described, the wings look more solid, and the green is of a rather more olive hue, but the dark marks remain on eyes and wing-base, and the pink dorsal and lateral lines are still conspicuous. The hairs are rather more numerous dorsally and laterally, *i.e.*, along the lines of “flanges.” The pupa is of the usual Plebeiid form, 9.4mm. long in the specimen observed, 3mm. at the widest portion (3rd or 4th abdominal segment), tapering slightly forwards, more rapidly backwards, rounded at each end. As in other Plebeiids, the posterior extremity behind the end of the appendages is very short, about 1.4mm. The pupa is one of the most hairy of the Plebeiids, the hairs being at least as numerous as in *coridon* for example, and though the pupa is smaller, the hairs are of much the same length, 0.15mm. The colour of the pupa shell is pale terra-cotta, so that the colour of the living pupa is that of the contained fluids till the imago matures. The glazed eyes are, however, nearly black, and the maxillæ and antennæ are darker than the rest of the pupa. As in various other Plebeiids, the ends of the maxillæ dip into the pocket behind the 5th abdominal segment to a depth of 0.8 or 0.9mm. The cremastral area is entirely without hooks, but has (*i.e.*, the 9th and 10th segment have) some 16 ordinary hairs and 3 or 4 lenticles. The hairs on the head, and those on the thorax and even the abdomen are somewhat similarly circumstanced, and are each surrounded by a small area into which the netted sculpturing does not encroach, giving a very pretty and special effect; this arrangement does not obtain, in the Plebeiid pupæ examined, to a sufficient degree to attract notice, though it is universal, in pupæ possessing them, for the lines of sculpturing to avoid hairs and lenticles. The netted sculpturing is much better appreciated in a photograph than by description. There is a dorsal head-piece, each half of which (about 0.8mm. long) remains in dehiscence attached to the prothoracic margin, it is narrow and shuttle-shaped. The prothorax (each half about 2mm.  $\times$  1mm.) is well sculptured and plentifully supplied with hairs and lenticles. The cover of the first spiracle on margin of mesothorax (0.4mm. long) has the usual appearance of a crowd (but a very orderly one) of minute hairs with tabular tops. There is a dark shade across the wing origin, and at its middle is a place to which the lines of netting converge, but fade out as they reach it. The lenticles on the legs are few and minute, and are detected with difficulty. There are large flights of lenticles round the spiracles and a good many hairs, and some smaller points that are rather numerous and look more like hair-bases than lenticles.

HABITS.—This species may be called the “zigzagger,” for it darts swiftly to and fro when on flight, showing first its grey underside and then its black upperside, so that one can hardly follow it with the eye.

It settles abruptly, taking up no fixed position with regard to the sun, sometimes letting the wings slowly down after settling, but most often leaving them closed over the back, the forewings quite close, the hindwings slightly separate from each other. In this position it generally moves the hindwings slowly up and down alternately, and continues doing so for some time. Sometimes, however, when settled on a flower in this position it will slowly work its way round, until the sun shines on its back, its wings let down slowly, until the sun falls directly on its deeply coloured dark wings, causing it to drop them lower and lower, until at last they are something less than horizontal, in which position it rests for a time, when it will move round again and again, the angle of inclination of the wings to each other varying with its changing position. It chooses a variety of flowers on which to rest and feed, and imagines were observed on August 2nd, 1907, at Brugnasco, to alight on yellow trefoil, knapweed, scabious, and thyme, the latter being repeatedly chosen. But the ♂ particularly loves to bask on a damp spot in the hot sun, and many were observed on the date just mentioned, with the ♂s of a fine dark-banded form of *Plebeius argus* (*aegon*) and *Agriades coridon*, revelling on the edges of the mud-patches made by runnels trickling across the path just before reaching Brugnasco; a few were also observed with clouds of *Plebeius argyrognomon* (*argus*) on the shores of Lake Ritom, near Piora, on August 8th, at some 6,000ft. above the sea, where the most marvellous little hordes of blues we ever witnessed were taking a sun bath on the damp earth. This species is rarely found at the damp spots except in the hot sunshine. Towards the end of the afternoon it loves to sit on the top of a flower-head, grass-culm, or leaf, its wings wide open, its head rather downwards, so that the sun shines fully on all its wings. Next to *Agriades coridon* the species appears to be the most pugilistic of all the "blues." Not only does it attack the smaller butterflies that seek to join it on the flowers, but on August 18th, 1907, on the Albula Pass, we observed successive specimens attack and drive off *Erebia pronœ*, *E. tyndarus*, and *Hesperia alveus*. When ♂s of this species chase one another, they usually keep a considerable distance above the ground and fly so rapidly that the eye can only follow them with difficulty. The ♀s are not so pugnacious as the ♂s, but they gird very much at being disturbed; one never sees them at puddles or runnels of water, and, if not busy egg-laying, they may generally be found feeding on flowers, the wings tightly pressed over their backs, or, when the feeding is over, sunning on flowers or herbage. An observation on August 18th, 1907, on the Albula Pass, showed that thyme, scabious, and knapweed were here the most frequented flowers. Sitting with its wings expanded on the top of a flower, its antennæ well thrown out at a wide angle in front, it loves to sit with its wings let down a good deal short of horizontally, the forewings well forward, but the hindwings drawn right back so that the inner margin is quite close to the body and a wide angle thus left between the fore and hindwings. When walking it either throws both wings back over its body, the forewings fairly well advanced but the inner margin quite covered by the costa of the hindwings, or it lets them down somewhat but holds them in the same relative position, *i.e.*, it does not draw back the hindwing (which, if it

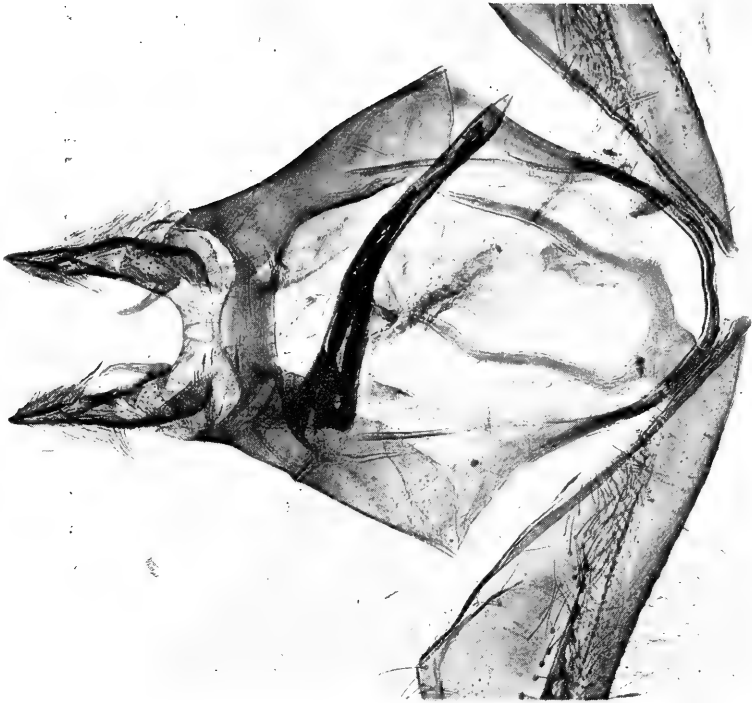


EXPLANATION OF PLATE XXVIII.

(*To be bound facing Plate XXVIII.*)

Fig. 1. Appendages, ends of clasps out of picture,  $\times 30$ . Note the *Ædœagus* (a little dislocated). The slender portion to the right, nearly two-thirds of the whole length, is the free portion, projecting beyond the floor of the cavity. The great proportionate length of this portion is an important character in the genus (*Aricia*). Sufficient of the left clasp appears to show some of the spinous ridges better seen in

Fig. 2. A portion of the clasp  $\times 60$ . These spinous ridges are along the line dividing the armed from the soft half of the clasp. They are a marked specific character, hardly a trace of them occurring in any other species of the genus.



*Photo. F. N. Clark.*

A. MEDON. ♂ APPENDAGES, TEGUMEN AND RING, &c.  $\times 30$ .  
PORTION OF CLASP  $\times 60$ .





did so, would be in way of the body) so as to pass the inner margin beneath the abdomen, as it does when sunning itself with widely-opened wings. In confinement it will feed greedily on moistened sugar, and readily returns again and again to the feast even when one would consider that it must be satiated. When walking the legs are moved alternately, and it can walk very rapidly. When flying, its flight is difficult to follow, and it flies only in the bright sunshine. It prefers thistles and knapweed when seeking food. It is very pugnacious, and may often be seen battling with *Polyommatus icarus* and *Epinephele janira*. It rests at about 7.30 p.m. In Durham, it rests on plantain heads and grass stems, with *P. icarus*, and, less commonly, on the flowers of geraniums, but in Scotland, I have found it resting on plantain heads, the flowers and stems of *Campanula glomerata*, and upon the bare ground. When resting with *P. icarus* it can be easily distinguished by the superior length of its wings. Any one wishing to know the use of the eye-spots on the underside of the wings, should see a few imagines at rest on the heads of *Plantago lanecolata* between 8 p.m. and dusk (Harrison). In sunshine the butterfly is a very active little creature, which is easily lost sight of when flying rapidly over the meadow, especially when the two sexes are amusing themselves with love-affairs. They then flew rapidly in wide curves over the meadow, and were in a moment lost to my sight, but just as quickly they returned, singly, into my neighbourhood. When they flew rapidly in the sunshine they seldom settled on a flower; only in the morning and evening did I see them quieter, and feeding on heath and other meadow-flowers (Gillmer, *in litt.*) Barrett observes that it is "not a very active butterfly," but "flits quietly about warm hillsides and open fields, or the sheltered sides of sand-hills;" he adds that it is "very fond of resting and sleeping on tall grass stems, particularly on the rolled up leaves of the marram grass (*Ammophila arvensis*)." Both Tugwell and Duncan remark on its fondness for resting on the flowers of the common rush, and Stewart and Buchanan White speak of it as specially attached to blue flowers, the former particularizing the blue scabious (*Knautia arvensis*), and the latter *Lycopsis arvensis*, the bugloss. On July 21st, 1899, a specimen was found by Studd in his *light* trap at Oxtou, Devonshire.

**TIMES OF APPEARANCE.**—There is not the same difficulty in fixing the number of broods in Britain in this species as is experienced in the case of *Polyommatus icarus*. The line of demarcation between the single and double-brooded areas falls approximately across the centre of England. Wailes observed that if we draw an isothermal line across Europe of  $51^{\circ}$  the localities to the north of this will be found to produce one brood only, those to the south of it two. He has, however, fallen into the error of placing the average temperature a degree above  $50^{\circ}$  instead of below, as is shown by the average temperature given by him for the localities he cites, and instead of an isothermal line of  $51^{\circ}$  Farh. we should read  $49^{\circ}$ , in which case his observation becomes, with but few exceptions, remarkably correct. In the South of England the species is regularly double-brooded in all seasons, though it is possible that some larvæ of the early summer brood hibernate even in the regularly double-brooded area; this reaches further north than was supposed by Newman, for the species appears twice in the year both in

the Chilterns and the Cotswolds, even in such seasons as postpone the emergence of the second brood till well into September. Jeffreys, for instance, observes that in the latter locality the second brood did not appear till September 12th in 1888, while in 1887 it appeared early in August. In Essex it is undoubtedly double-brooded, and this is no doubt the case in the neighbourhood of Worcester, as the dates we possess from that locality extend from July 30th to August 30th, which, considering the dates of appearance in the north of England and in Scotland, must certainly imply an earlier brood, as must also the record for September, 1893, for the neighbourhood of Birmingham. Bath, indeed, who supplies this record, suggests the possibility of a third brood, but although one of the earliest records we possess is for the same year, the suggestion of a third brood almost on the borders of the single-brooded area must be regarded as untenable. From the borders of Norfolk and Suffolk, at approximately the same latitude, Norgate's records show that the species is double-brooded, for not only has he taken it in May and throughout August in different years, but he records it, in 1884, both for May 27th and August 20th, though the species is scarce in these counties. Further north even than this, the dates of September 3rd from Allington, in Lincolnshire, and the many dates in late August from the north coast of Wales, leave little doubt of an earlier emergence at this latitude also, and under these circumstances it may be regarded as probable that the appearance of the species in Dovedale in the last week in May implies a second brood here also; but beyond this line all the evidence points to a single brood only. Even in such early seasons as 1893 and 1896, when *medon* appeared at Witherslack in the last week in May, there is no record which hints at the possibility of a later brood.

In the double-brooded area the average time of emergence is about the last few days in May and the first few in June for the first brood, and the first week in August for the second; though the first brood often appears earlier in May, and we have even records for April 30th (Prideaux) at Reigate, and the last week in April from so far north as Swansea (Robertson). Similarly, the second brood often appears by the end of July, and, exceptionally, as late as the second week in September. In most seasons, however, the second brood is worn out by the middle of this month, though records of its continuance well into October are not wanting. In the single-brood area in Britain the date of emergence varies somewhat as we advance north, and to a greater extent with the season. In its north Lancashire and Westmoreland haunts, Witherslack, Grange, Arnside, etc., this species seems generally to appear in June, earlier or later according to the season, and to last till the middle or end of July; we have found no record of August for these localities, but, on the other hand, in 1893 and 1896 it was taken on the 26th and 28th of May respectively. Harrison states that in Durham it emerges the first week in July and continues on the wing for a month, and that in Scotland the second week in July is the usual time and that it continues flying for eight weeks. This however is subject to considerable variation, since he states that the species was out ten days earlier in 1906 than in 1904, and we have a record from Rannoch of June 27th. This variation in the time of emergence in Durham is connected with one or two remarkable circumstances, related by

Harrison in a passage which it is worth while to quote in full. He observes (*Ent. Rec.*, xviii., p. 247) *A. medon* "and its aberrations were very abundant this year [1906], in all its known haunts. I should think its numbers were about six times that of a normal year. This is the more extraordinary, as a friend and myself went for larvæ at the end of April, and, except for a single larva I obtained, not one was visible. In an ordinary season between two and three dozen larvæ has been the usual take. What was still more remarkable was the absence of any indication of the larvæ feeding. My friend Mr. Johnson, of Gateshead, also made a search, and also with a total catch of one. I fancy the larvæ fed up very early in the spring, or took advantage of the open winter and fed up then. Or, perhaps, with the hereditary tendency to double-broodedness, the larvæ fed up last year in the warm autumn we had, and remained as pupæ all the time. A slight confirmation of one or other of these surmises I see in the fact that, in spite of the cold June, the insect was out about ten days earlier this year than in 1904."

Chapman, on the contrary, writes (*in litt.*) as follows:—

"I obtained eggs of this species in June, and took some young larvæ with me to Switzerland on July 1st. Several died, but I brought home with me six larvæ apparently in 4th skin (one beyond hibernating stage) on August 17th. A few days later they all died. I found at home a plant on which I had left a few eggs. It was placed out of doors on the south side of the house, under a sleeve of thin net, that was intact. There was no sign of larvæ having fed up or emerged, but many traces of the feeding of young larvæ, and there I find to-day (September 5th, 1908) two specimens, under leaves, very small, apparently thinking of hibernating." And again:—"Eggs laid in June, some larvæ taken through July to Switzerland and brought home in August, then died, apparently waiting to hibernate and being interfered with in that desire and unable to go forwards. Other eggs were left on a plant at Reigate, in mid August several small larvæ were on the plant and were quiescent, no sign of any larvæ feeding up or having fed up.

On December 1st, a larva about 3.5mm. long was seen and disturbed, and hung by a thread, and was quiet motionless as if dead so long as watched. December 2nd. The larva has crawled up and is resting on a small half-dead leaf.

Both these lots ought to have produced summer imagines in August. I fancied my Swiss ones failed by being taken to Saa Fée and Zermatt, where the temperature (except in the sun, which was not allowed them) was too low for them to progress. Still, I think when they died they were beyond hibernating stage, and had all gone well with them, they would have emerged this year. Their deaths may be attributed to their unsatisfactory treatment. Those, however, in the pot at home, clearly are acting as examples of a single-brooded race would do. The whole experience shows the English *medon* to have a strong tendency to be single-brooded (Chapman).

The question whether the single or double-brooded habit is ancestral of course depends on the original home of the species, that is, whether it is one which has spread from high latitudes (or altitudes) to lower ones, or *vice versa*. Grum-Grshimailo advances

a theory (*Rom. Mém. Lép.*, iv., p. 393) that the species originated in the Pamirs, on the ground that it is there found in all its different forms (except the exclusively British *artaxerxes* and *salmacis*), from which he concludes that these forms must have arisen there at the different altitudes, up to 14,000 ft., at which it occurs, helped by the different aspects of the slopes on which it flies. This, however, ignores the fact that these differences of conditions are the very cause of the variation, and that these various forms, in spreading over the ground at present occupied by the species, must all have encountered practically identical conditions, often for long periods, so that the differences would tend strongly to become lost, and would have to be re-acquired. As he specially remarks on the fact that the specimens from the highest elevations do not differ from the mountain forms of Europe, his facts really suggest that similar climatic conditions tend to produce similar forms. This certainly holds good, both in altitude and latitude, with regard to the number of broods, but so far as our records and observations go, we have never found any tendency in the single-brooded areas to the production of a second brood, nor in the double-brooded areas to a suppression of the second brood, except under abnormal treatment of the larvæ such as described above by Chapman. Where more than two broods occur annually it is quite likely that the actual number may be dependent on the peculiarities of different seasons, the tendency then being to become as nearly continuous-brooded as circumstances will permit; the localities, however, where more than three broods occur are very few.

In Europe, speaking generally, the isothermal line of 49° holds good as the division north of which this species is single brooded, the most notable exception being Denmark, for which both Bang-Haas and Aurivillius give two broods, appearing in May-June and August-September respectively; in the rest of Scandinavia, as far north as it occurs, there is but one brood, appearing in June and July. In Finland also Federley describes it as being not rare up to 66° N., in June and July. In Holland Snellen gives its time of flight as May, and again from July to September, which seems to imply a somewhat earlier date than is usual with us, and also a probable variation of the time of appearance of the second brood in different seasons; Lambillion also mentions May as the time of appearance of the first brood throughout Belgium, but only speaks of July and August as the time of the second brood. Throughout France, of course excepting the higher Alps, there are two broods, with indications of a third, as might be expected, in the extreme south, since we have taken it at Hyères as early as March 28th, and Reverdin records it from Bandol (Var) for March 30th, while Rowland-Brown found it at Beaulieu (also on the Riviera) as late as October 9th. Two broods, again, are the rule in Spain, in the Sierra Nevada as well as in the Central Table-land, but both north and south of this lowest Mountain-chain there are at least three, *e.g.*, Granada and Algeciras, while at Gibraltar Walker reports it as being on the wing most of the year, from February to November, which seems to imply four or even five broods. Throughout Germany *medon* is double-brooded where it occurs, the two broods usually appearing at the end of May or the beginning of June, and the end of July or early in August; there are, however, many

localities, even in the north, where the first brood is recorded somewhat earlier in May, and the second as still flying in September. In East and West Prussia it is recorded as early as May 19th, continuing till June 18th; here, however, it would seem that the appearance of the second brood is somewhat uncertain, and that in some years, at any rate, it consists of very few specimens (Schmidt, Rastenburg), but Speiser seems to consider the second brood at least as common as the first, though both are rare. In Pomerania the same times of appearance hold good, but the species is in some places by no means uncommon, while in others it is of extreme rarity. From Hamburg we have found no records earlier than July and August, but these certainly imply an earlier brood. It is reported from Posen as being abundant everywhere in July and August by Schultz, but as the same author also speaks of it as occurring frequently all through the summer, there are no doubt two broods here also. Elsewhere there are records of the usual two broods throughout Germany, even in the mountain districts. In Switzerland the species is double-brooded, according to Frey, throughout the plain and the sub-alpine region, but single-brooded at the higher levels, he mentions in particular that it is single-brooded at Bergün, which is situated on the Albula Pass at a height of about 4,500ft. Favre speaks of two broods in the Valais, flying in May and June and August and September respectively, and mentions that it reaches a height of 7,500ft., without a hint of its becoming single-brooded, but this is certainly an oversight, and it is doubtful whether a second-brood ever occurs in the Alps so high as 5,000ft. We have many records from Switzerland, from which we infer that at the higher levels there is but one brood, as stated by Frey, which appears towards the end of June or as late as the middle of July according to altitude and the particular conditions of the season, continuing on the wing till the middle of August, or even rather later. Throughout the Austrian Alps the same conditions apply, but at lower levels, as in Switzerland, the two broods are on the wing from the middle of May throughout June, and from the last ten days of July into September. In northern Italy, again, the same conditions obtain as in Switzerland and the times of appearance both in the Alps and the lowlands are the same, except that the first brood occurs somewhat earlier, since we have ourselves taken it at Locarno as early as April 20th, and then by no means in its first freshness. Stefanelli reports it from Tuscany in April, May and June, and again in August and early September, but apparently does not even take the idea of a third brood into consideration, but since it is recorded by Wheeler from Assisi from June 24th to July 10th, and as late as September 20th from Perugia, it seems far more probable that in Central Italy there are normally three broods, the June specimens recorded by Stefanelli belonging to the second and not to the first, especially since the species is recorded from Florence by Rowland-Brown as early as April 5th. In Malta Fletcher's dates leave no doubt that there are four broods, though some difficulty is raised by a single specimen of var. *calida* taken on June 14th, 1902, and the fact that the species was abundant on June 10th, 1903, and common on June 18th, 1896; in 1902 he records it as early as March 8th, the species being worn on April 14th; on May 13th it was

common and quite fresh whilst on June 2nd it was beginning to be worn; he again obtained a few specimens on August 18th, and had found it fresh on September 23rd, 1901, after having taken the var. *calida* commonly on July 27th of the latter year. Mathew observes that in Malta the July brood is the most abundant. In Hungary Aigner-Abafi reports the occurrence of two broods, the first in May and June, the second in July and August. For Roumania Fleck gives more particularly May to the end of June, and the end of July to the beginning of September. Bulgaria must also, as is to be expected, produce two broods, for though Bachmetjew only mentions the species as being scarce in August, Mrs. Nicholl also records it in May and June. In Greece, though apparently nowhere common, there would seem to be as many as four broods. Staudinger took it on Parnassus from the beginning of March to the end of April, and in Attica and on the island of Naxos to the end of March, the second brood appearing in Naxos in May and on Parnassus in June. It must therefore be the second brood which is described by Miss Fountaine as being generally distributed in May and June, whilst it was no doubt the first that Elwes obtained at Athens on April 11th, and the second that he took at different dates in May in the Morea, the island of Corfu and on Parnassus; de la Garde's date of October in Corfu certainly seems to imply an intervening brood somewhere about August. In the neighbourhood of Constantinople, on both sides of the Bosphorus, the information we have been able to gather points to the occurrence of three emergences, though not necessarily of three broods, strictly speaking. We have no date earlier than May 2nd, whilst a fresh brood appears near the middle of June, and another towards August 20th, the latter lasting, though in a very worn condition, till the middle of September. It is, of course, possible that the specimens taken early in May may belong to an April emergence, in which case, three regular broods may be inferred, otherwise it would seem more probable that the May specimens result from "laggards" of the previous year's first brood, the June specimens being the offspring of the last year's second brood. Elsewhere in Asia Minor there are at least two broods; Holz says that this species is common throughout Cilicia in April and May, and again later in the *aestiva* form, while Miss Fountaine reports it as common round Amasia throughout the summer, but we have no positive information of an autumn brood. In Russia *medon* is single-brooded in those Governments from which we have any precise information, though in Tambov it sometimes appears in May, yet June and July are its regular months of flight, as is also the case in Moscow (Assmuss); Dampf records it from Wilna in July and from Jaroslav from the middle of June till the end of the first week in July. It occurs also in the Baltic Provinces as early as June (Teich), and in the Southern Governments it may possibly be double-brooded, Romanoff stating that it occurs all summer in Transcaucasia, but we have no definite dates by which this can be fixed. Though it is wide-spread in Asia we are somewhat lacking in exact data as to its times of appearance. On the Eastern shore of the Caspian it occurs in May (in the *myrmecias* form), but we have no evidence of a later brood. Further north than this it is probably single-brooded as the few dates at our disposal, taken in

connection with the climatic conditions, indicate, though Glazunow's captures in May and June at Pendshakent, and the dates June 5th, in Sarafschan, and June 11th and 19th, in Dschungaria, might admit of a second brood, but in the Altai (the only definite date in which range that we have found is Ongodai, July 10th) and to the north of Pekin, where Herz states that it flies in June and July, it may be regarded as almost certainly single-brooded. The *nazira* form in the north-west Himalayas, and doubtless also in Persia, has at least two broods, for there are several records for October, but we have no evidence as to the date of its early emergences. Coming back to Syria our information is on a very different scale, though we have no records, even from the plains, earlier than May 10th, near Damascus, but by the end of that month it has been taken, even up to 6,000ft., in the Lebanon and Anti-Lebanon; it occurs again at the beginning of July near Beirut, and throughout the month in the mountains, and a third emergence takes place, both in plain and mountains about the beginning of September. In north-west Africa there seem to be but two broods, no record appears to be given of any autumn emergence. It is reported, for example, from Biskra in February and May, and from Lambessa and other localities in March and June. Meade-Waldo, to whom we owe most of our information on this species in Morocco, states that it only occurs there from April to July, there being two broods differing somewhat in form. In Teneriffe Holt-White merely states that it occurs from April till September, which may imply three broods, or only two. The following dates have been collected from various sources and may serve to illustrate and supplement the above observations:—April 23rd, July 15th, 1844, at Messina, May 17th and 31st, 1844, at Syracuse, June 8th and 12th, 1844, at Catania, June 30th, 1844, on *Ætna* (Zeller); in June, 1856, on the Yaila Dag, Crimea (Young); in July, 1866, at le Prese (White); middle of August, 1876, at Bellagio (Forbes); June 24th-July 5th, 1878, on the Riffelberg (Jordan); May 2nd, 1879, at Port Baklar (Mathew); June 20th-25th, 1880, near Reval (Huene); May 8th, 1882, at El Kantara, May 11th, 1882, at Lambessa, May 15th, 1882, at Constantin (Brit. Mus. coll.); September 1st, 1882, at Pierrefitte-Nestalas (Jones); July 10th, 1883, at Carlsbad (Becher); October 5th-15th, at Mandi (Brit. Mus. coll.); August 24th-28th, 1886, in Jersey (Jordan); June 4th, 1887, at St. Brelade's Bay (Hawes); June 15th, 1887, at Stresa (Jones); July 15th, 1887, at Skogstad (Elwes coll.); July 20th, 1887, at St. Sauveur (Elwes); May 3rd, 1888, at Carqueiranne (Jones); April 22nd, 1889, at Hyères, not very common (Norris); June 11th and 19th, 1889, in Dschungaria (Brit. Mus. coll.); June 5th, 1890, at Digne (Jones); June 26th-July 6th, 1890, at Engelberg (Bethune-Baker); June 30th, 1890, at Spalato, June 2nd, 1891, at Malamocco (de la Garde); June 5th, 1892, in Sarafschan, October 3rd, 1892, August 12th, 1893, at Ranikhet (Brit. Mus. coll.); May 30th, 1893, at Ajaccio (Standen); June 15th, 1893, at Vizzavona (Jones); July 17th and 18th, 1894, at Randa (Reverdin); beginning of August, 1894, at Saas Fée (Rowland-Brown); May 25th-29th, 1895, at Grupont (Bath); August 10th, 1895, at Randa (Reverdin); April 5th, 1896, at Florence (Rowland-Brown); last half of April, 1896, at Digne, just coming out, July 25th and 26th, 1896, at Grésy-sur-Aix, beginning of August, 1896, at le



Lauteret, middle of August, 1896, at Bourg d'Oisans, August 18th, 1896, at Bourg d'Aru (Tutt); June 18th, 1896, at Malta (Fletcher); July 21st-August 9th, 1896, at Randa (Reverdin); middle of April, 1897, at Veytaux, early in August, 1897, at Bérissal (Wheeler); middle of June, 1897, at Fontainebleau (Tutt); April 5th, 1898, at Hyères (Rowland-Brown); April 21st, 1898, at Pont du Gard (Tutt); July 18th, 1898, at Ongodai (Brit. Mus. coll.); July 24th, 1898, at Bashkano (Elwes); August, 1898, in the Zmuttthal (Jones); March 30th, 1899, at Bandol, July 2nd and 31st, 1899, at Loèche-les-Bains (Reverdin); May 21st, 1899, on Mt. Vitoch, May 23rd, 1899, at Slivno, June 26th, 1899, in the Rilska Valley (Nicholl); June 4th-18th, 1899, at Digne, June 23rd and 24th, 1899, at Susa (Rowland-Brown); July 15th-August 25th, on the Brenner Pass (Galvagni); July 27th, 1899, on the Simplon Pass, very common, August 7th, 1899, at Evolena (Tutt); April 11th, 1900, at Athens, May 9th, 1900, in Corfu, May, 1900, in the Morea, May 22nd, 1900, on Parnassus (Elwes); May 10th, 1900, at Jedidah, end of May, 1900, from 3,000-6,000ft., in the Lebanon and Anti-Lebanon, June 4th, 1900, at Suk Wady Farada (Nicholl); July 11th, 1900, at the Baths of Bormio (Rowland-Brown); July 21st-August 9th, 1900, on the Brenner Pass (Galvagni); August 9th to 16th, 1900, at Abriès, August 20th, 1900, at Grésy-sur-Aix (Tutt); beginning of September, 1900, at Rennes (Oberthür); April 3rd, 1901, at Tangier, May 30th, 1901, at Bershid, May 29th, 1901, at Meduna, June 6th, 1901, at Marrakesh, June 9th, 1901, at Ouad Moorbey, July 8th and 19th, 1901, at Imentella (Meade-Waldo); May 16th, July 27th, September 23rd, 1901, at Malta, June 30th, 1901, at Gibraltar, common (Fletcher); May 18th-20th, 1901, at Granada, (Nicholl); July 29th, 1901, at Mende (Rowland-Brown); August 2nd, 1901, at Torre Pellice (Tutt); August 9th, 1901, at Biedenkopf (Jäger); August 17th, 1901, at Bérissal (Keynes); September 8th, 1901, at Platurus (Bate); October, 1901, in Corfu (de la Garde); March 8th, April 6th and 14th, May 13th, 15th, 17th and 24th, June 2nd, 7th and 14th, August 18th, 1902, at Malta, April 25th, May 1st, 3rd and 8th, 1902, at Aranei Bay (Fletcher); beginning of June, 1902, at Locarno, frequent, July, 1902, at Bejar, everywhere (Chapman); end of June, 1902, at Certosa di Pesio (Lowe); June 27th, 1902, at Martigny, July 6th, 1902, at Bérissal (Sheldon); August 14th-16th, 1902, at Chamonix, August 18th-22nd, 1902, at Bobbie and Au Pra (Tutt); August 30th, 1902, at Nauplia, October 8th, 1902, at Messina, October 24th, 1902, at Suda Bay (de la Garde); October 9th, 1902 at Beaulieu (Rowland-Brown); March 28th, 1903, at Hyères, April 6th-9th, 1903, at Auribeau, just coming out. April 13th, 1903, at Albenga, April 20th, 1903, at Locarno, worn, July 29th, 1903, at the Combe d'Arolla, August 13th, 1903, between Useigne and Vex (Tutt); April 2nd-10th, 1903, in Corsica (Muschamp); middle of April, 1903, at Menaggio (Sich); April 24th, 1903, at Pont du Gard, numerous and in good condition, July 26th, 1903, in the Laquinthal (Sheldon); June 10th, 1903, at Malta, abundant (Fletcher); June 24th, 1903, at Heggiswyl, July 23rd and 24th, 1903, above Wassen (Keynes); July 11th, 1903, at Ajaccio, July 13th, 1903, at Bocognano, July 26th, 1903, at St. Martin Vésubie (Rowland-Brown); middle of July, 1903, at Canales, not abundant (Chapman); July 31st, 1903, in the Laquinthal,



August 7th, 1903, at Simplon (Reverdin); August 1st, 1903, at Vex (Wheeler); May 11th, 1904, at Pont du Gard, one only, July 3rd-23rd, 1904, at Puerto de Pajares, July 23rd-August 2nd, 1894, at la Granja, (Chapman); June 19th-23rd, 1904, at Macolin, July 2nd and 3rd, 1904, at Grindelwald (Lowe); June 25th, 1904, on the Isle des Princes, Constantinople, July 21st, 1904, on the Col. Ferret (Muschamp); end of June, 1904, on the Eggishorn (Pearson); beginning of July, 1904, at Beirut, throughout July, 1904, at Ain Zahalta and on Jebel Zahalta (Graves); July 7th, 1904, at Kahlenburg, July 14th, 1904, on the Mendel Pass (Rowland-Brown); July 23rd, 1904, at Basle, July 30th, 1904, at Gex, August 5th, 1904, in the Saas Valley, August 12th, 1904, abundant in the Ferpècle Valley (Tutt); August 6th, 1904, on the Almagell Alp, August 11th, 1904, at Saas Fée (Reverdin); April 23rd, 1905, at Granada, June 20th, 1905, at Arcachon, July 1st, 1905, on the Simplon Pass, July 7th, 1905, on the Campolungo Pass, July 29th, 1905, in the Steinenthal (Muschamp); April 24th, 1905, at Hyères (Tutt); May 18th, 1905, near Damascus, May 28th-30th, 1905, near the summit of Jebel Baruk, about 6,500ft. (Graves); May 30th and 31st, 1905, at Barcelona, June 15th, 1905, at Montserrat, June 17th-27th, 1905, at Vernet (Standen); June 20th, 1905, in the Bois des Frères, Geneva, July 14th, 1905, at Brides, July 21st, 1905, at Champagny le Haut, August 7th-15th, 1905, at Chandolin (Reverdin); June 22nd, 1905, between Leuk and Leukerbad (Pearson); June 27th, 1905, in the Oythal, June 28th, 1905, on the Seealp (Dadd); June 29th-July 12th, 1905, in the Wengen district (Moss); July 10th, 1905, at Vernet (Rowland-Brown); July 11th, 1905, at Igls (Bentall); July 19th-23rd, 1905, at La Granja (Sheldon); August 4th, 1905, at Gavarnie (Turner); May 25th, 1906, at Geneva, July 24th and 25th, 1906, on the Dents du Midi, end of July, 1906, at Digne (Muschamp); May 27th, 1906, in the Vallon d'Allondon, June 7th, 1906, in the Bois Taille, Geneva, July 15th-30th, 1906, at Arolla (Reverdin); July 30th-August 3rd, 1906, at Clelles, scarce, August 24th, 1906, at Versoix, not common (Tutt); May 7th, 1907, at Carcassone (Rowland-Brown); May 30th, June 10th, August 5th, 1907, at Geneva, July 5th, 1907, at Gimel, July 10th, 1907, on the Campolungo Pass (Muschamp); May 30th, 1907, at Sion (Tetley); June 6th, 1907, at Versoix, July 8th, 1907, on the Simplon Pass, 4th Refuge, July 12th, 1907, at Alpien, July 25th, 1907, at Zinal, July 28th, 1907, at Crevin, August 4th, 1907, at St. Cergues, August 25th, 1907, at Randa (Reverdin); June 10th, 1907, at Kelenföld (Jones); June 13th-24th, 1907, at Bérissal (Prideaux); June 16th, 1907, at Vernet (Keynes); July 1st, 1907, on the Oberalp Pass, July 25th, 1907, on the Rigi, August 4th, 1907, at St. Moritz (Turner); beginning of July, 1907, at Bludan, throughout July, 1907, at Ain Zahalta and Aleih (Graves); July 5th-7th, 1907, at Martigny, July 8th, 1907, in the Ganterthal, July 10th and 11th, 1907, in the Laquinthal (Rehfous); July 29th, 1907, at Göschenen, July 30th, 1907, at Andermatt, August 2nd, 1907, at Bruggnasco, August 4th, 1907, in the Piotta Gorge, August 5th, 1907, in the Piottino Gorge, August 14th, 1907, in the Roseg Valley, August 24th, 1907, at Thusis (Tutt); August 27th, 1907, at La Bouille, near Rouen (Oldaker); September 4th, 1907, at Fiesole, September 20th, 1907, at Perugia (Wheeler); April 18th, 1908, at Pardigon, May 28th, 1908, in the Vallon d'Allondon,

June 26th, 1908, on the Grand Salève, July 12th, 1908, at Leuk, July 17th, 1908, at Leukerbad, July 21st-28th, 1908, in the Argentière district, August 2nd, 1908, at Versoix, August 11th, 1908, at Saas im Grund, August 25th, 1908, at Isella (Reverdin); April 21st-29th, 1908, at Algeciras (Sheldon); beginning of July, 1908, at La Granja (Lowe); July 30th, 1908, at Charmes (Gibbs); August 2nd, 1908, at Barcelonnette (Rowland-Brown); August 2nd, 1908, at Trient, August 13th, 1908, at Zermatt (Page); August 3rd, 1908, in the Dischmathal, August 4th, 1908, in the Landwasser Valley, August 5th, 1908, in the Sertigthal, August 8th, 1908, on the Fluela Pass, August 9th and 10th, 1908, at Lavin, August 12th, 1908, on the Ofen Pass, August 13th, 1908, in the Muranzathal, August 14th, 1908, in the Münsterthal, August 17th, 1908, between Gomagoi and Sulden (Tutt); May 18th, 1909, at Martigny, very sparingly, June 1st, 1909, at Vernayaz, June 3rd, 1909, at Sion, June 6th, 1909, at Caux, June 7th, 1909, at Bex, June 18th, 1909, on the Simplon Pass, at the 2nd Refuge, June 24th, 1909, at Aigle (Alderson); May 21st, 1909, in the Promontor Marshes, abundant (Sheldon); May 23rd, 1909, at Versoix, July 12th, 1909, at Brides, July 14th and 15th, 1909, at Moutiers, July 20th, 1909, at Pralognan, August 2nd, 1909, at Allevard (Reverdin); May 23rd, 1909, at Axat, June 5th, 1909, at Mottig, June 6th-13th, 1909, at Vernet (Tetley); June 7th-19th, 1909, at La Bourboule (Prideaux); June 24th-July 10th, 1909, at Assisi (Wheeler); June 25th-July 2nd, 1909, at Reazzino, July 25th-August 1st, 1909, at La Grave (Lowe); June 28th-July 26th, 1909, in the Vallée de Joux, July 5th-25th, 1909, at Éclépens, July 16th, 1909, at Champagnole, July 18th-21st, 1909, on Mt. Tendre, July 31st, 1909, on Mt. d'Or, July 31st, August 1st, 1909, at Vallorbe (Gibbs); August 1st, 1909, on the Arlberg, August 2nd, 1909, in the Moosthal, common, August 11th, 1909, at Neu Spondinig, very few (Tutt); August 7th-14th, 1909, at Mende (Rowland-Brown); middle of August, 1909, at Zinal (Page); May 27th, 1910, at Fontainebleau (Ashby); May 31st-June 2nd, at Tlemcen (Gibbs); June 29th, 1910, at Nyons, Drôme (Rowland-Brown); July 9th and 16th, 1910, at Bignasco, July 14th, 1910, at Fusio, September 18th, 1910, at Versoix (Reverdin); first half of July, 1910, at Herculesbad (Keynes); July 13th, 1910, at Sulmona, July 15th, 1910, below Villalago, July 18th, 1910, at Roccaraso, July 22nd, and 23rd, 1910, at Palena, July 27th, 1910, at Subiaco (Wheeler); July 17th, 1910, at Hospenthal, one, end of July, 1910, above Gondo, beginning of August, 1910, at Macugnaga, scarce, and at Saas Fée (Bethune-Baker); July 29th, 1910, on Mt. Vuâche (Tutt); September 2nd-6th, 1910, at Damascus, September 7th and 8th, 1910, at Bludan, 4,800ft., in good condition, September 14th and 15th, 1910, at Aleih, about 2,500ft. (Graves); throughout May, 1911, at Granada, occasionally (Jones); May 4th-12th, July 13th, beginning of September, 1911, at Kiathané, June 8th and August 26th, 1911, very fresh, at Erenkeui, June 16th, July 1st, August 6th, 1911, near Therapia, July 18th and 20th, September 16th, 1911, very worn at latter date, at Gyök-su, August 12th, 1911, near San Stefano (Graves); June 14th-16th, 1911, at Samoussy, scarce, June 23rd, 1911, at Faido (Wheeler); July 13th-30th, 1911, at Gavarnie, August 1st and 2nd, 1911, near Bordeaux, August 4th and 5th, 1911, at Dompierre-

sur-Mer (Rowland-Brown). BRITISH LOCALITIES.—August 23rd, 1823, on Dartmoor (Leach); July 27th, 1845, on Dumyot, September 13th, 1846, on the downs near Godstone Road (Stainton); June 27th, 1854, on Dunsinane Hill (Buchanan-White); June 16th-July 7th, 1856, at West Wickham (Simson); June 28th, 1856, at Llanferis (Gregson); August 1st-8th, 1856, at Shanklin, May 28th, 1857, at Box Hill, August 10th, 1857, at Bognor (Trimen); June 1st-7th, 1857, at Leckhampton and Birdlip (Merrin); July 9th, 1857, near Perth (Buchanan-White); July 21st-25th, 1857, at Bristol (Bingham); July 29th, 1857, at Warsash (Swinton); through August, 1857, near Reigate (Tugwell); August 16th, 1857, at Whippingham, abundant (James); August 17th-24th, 1857, at Brighton (Hind); August 18th, 1857, at Dover (Hayward); August 25th, 1857, at Braunton Burrows (Mathew); June 9th, 1858, at Stonesfield (Stretch); June 12th, 1858, in the New Forest (Farren); June 13th, 1858, at Deal (Harding); June 19th-22nd, 1858, at Folkestone (Drury); June 19th-23rd, 1858, in the Isle of Thanet (Cox); July 10th-12th, 20th-26th, August 10th, 1859, near Stonehaven (Thomson); July 24th-31st, 1858, at Dawlish (Rawlinson); July 31st, 1858, at Chatham (Tyrer); August 3rd-5th, 1858, at Leckhampton (Trye); August 15th, 1858, at Croydon (Gregory); June 8th, 1859, at Croydon (Rogers); August 5th-30th, 1859, near Worcester (Edmunds); August 13th-16th, 1859, at Lulworth (Green); July 2nd, 1860, at Arthur's Seat, Edinburgh (Mathew); August 7th, 1860, halfway between Callander and the Trossachs, August 8th, 1860, at Ardlin, August 21st, 1860, near Loch Earn (Lovell-Keays); June 1st-7th, 1865, at Witherslack (Hodgkinson); August 16th-30th, 1865, between Dover and Sandgate (Cox); June 27th, 1867, at Kinloch Rannoch (Buchanan-White); May 27th, 1868, at Cirencester (Harman); July 7th, 8th, 1870, at Bolt Head (Mathew); August 1st-8th, 1870, at Braemar (Buchanan-White); July 10th, 1871, at Dunse (Burder); August 13th and 25th, 1871, at Walton-on-the-Naze (Burrows); beginning of August, 1872, at Watlington (Lucas); May 8th, 1874, at Sparham (Norgate); June 1st-10th, 1874, at Abbott's Wood (Tugwell); May 28th, 1875, at Bluestone Wilderness, Norfolk (Norgate); July 1st, 1875, at Kinloch (Wassermann); August 13th, 1876, at Marlow (Clark); May 24th-31st, 1880, at Ashbourne, last week in May, 1881, at Dovedale (Hall); May 31st, 1881, at Sparham (Norgate); July 31st, August 12th, 1882, in the Isle of Purbeck (Bankes); September 16th-23rd, 1882, at Folkestone (Hall); June 30th, 1883, at Witherslack (Shuttleworth); July 6th, 1883, at Witherslack (Rose); July 28th, 1883, in the Isle of Purbeck (Bankes); August 18th-28th, 1883, at Llandudno (Harding); May 27th, August 20th, 1884, at Downham (Norgate); June 2nd-12th, 1884, in the Isle of Purbeck (Banks); July 23rd, 1884, at Grange (Hodgkinson); June 3rd, 1885, at Basingstoke (Hamm); August 17th, 1885, at Downham (Norgate); June 6th, 1886, at Basingstoke (Hamm); July 8th, 1886, at Inverurie, July 10th, 1886, at Braemar (Tugwell); September, 1886, at Trevalga (Riding); June 21st, 1887, on the Cheddar Cliffs (Bath); July 9th, 1887, at Cossford Castle (Elliot); July 24th-August 17th, 1887, at Deal, Kingsdown, St. Margaret's and Folkestone (Tutt); August 20th, 1887, at Brentwood (Burrows); June 10th, 1888, at Halstead (Turner); July 20th, 1888, in Glen Lockay (Morton); July

23rd, 1888, at Witherslack, August 4th, 1888, at Llangollen (Arkle); August 17th-mid-September, 1888, at Brighton (Hodgson); September 12th, 1888, on the Cotswolds, just coming out (Jeffreys); June 6th, 1899, at Bevingdean (Hodgson); June 7th-14th, 1889, at Arnside (Hodgkinson); June 19th, 1889, in Glen Lochay (Morton); July 31st-August 5th, 1889, in the New Forest (Hill); August 16th, 1889, at Folkestone, May 27th, 1890, at Riddlesdown (Turner); June 24th, 1890, at Dursley (Griffiths), and on the Cotswolds (Goss); July 9th, 1890, at Castle Eden Dene (Maddison); June 20th, 1891, at Eynesford (Turner); still out September 10th, 1891, at Seaton (Prideaux); September 11th, 1891, near Brighton (Hodgson); June 2nd-12th, 1892, at Abbott's Wood (Tugwell); July 22nd, August 20th, 1892, at Barnham (Norgate); July 24th, 1892, at Witherslack (Arkle); August 10th, 1892, in the Isle of Purbeck (Bankes); August 20th, 1892, at Reigate (Turner); April 30th, 1893, one only, at Dorking (Prideaux); May 6th, 1893, near Rochester, May 20th, July 22nd, 1893, at Cuxton (Tutt); May 7th, 1893, at Marlow (Clark); May 9th, 1893, near Hereford (Blathwayt); May 13th, 1893, at Horsley (Turner); May 26th, 1893, at Witherslack (Crabtree); July 3rd, 1893, at Clonbrook, Galway (Dillon); July 10th, 1893, at Barnham (Norgate); end of July, 1893, at Broadstairs (Bird); August 10th, 1893, at Southend (Burrows); September, 1893, near Birmingham (Bath); June 9th, 1894, at Reigate (Turner); June 17th, 1894, at Southend (Whittle); August 28th, 1894, in the Isle of Purbeck (Bankes); June 9th, 1895, on the S. coast of the Isle of Wight (Prideaux); June 13th, August 17th, 1895, at Reigate (Turner); June 29th, 1895, at Bervie (Gunning); July 10th-25th, 1894, at Stonehaven (Dalgleish); August 23rd, 1895, at Burwell (Norgate); last week in April, 1896, at Swansea (Robertson); May 15th, 1896, at Stroud (Davis); May 23rd, 1896, at Ashford (Wood); May 25th, 1896, at Dorking (Prideaux); May 28th, 1896, at Witherslack (Hodgkinson); June 6th, 1896, at Strood, July 27th, 1896, at Leigh, August 13th, 1896, at Chattenden (Turner); July 13th, 1896, in the Island of Purbeck (Bankes); August 3rd, 1896, on Canvey Island (Whittle); August 5th, 1896, at Bentley (Burrows); August 18th-31st, 1896, at Bryn Euryn and the Little Orme (Imms); May 23rd, 1897, at Box Hill, June 13th, 1897, at Reigate, scarce (Turner); May 30th, 1897, at Reigate (Prideaux); July 31st, 1897, at Bentley (Burrows); August 5th-September 9th, 1897, at Swanage (Hall); August 25th, 1897, at Llandudno (Renshaw); June 5th, 1898 (Prideaux); June 11th, 1898, at Reigate (Turner); June 15th, 1898, at Cavenham (Rothschild); June 19th, 1898, at Marlow (Clark); June 21st, 1898, at Hythe, a few, just coming out (Hill); July 2nd, 1898, at Galashiels (Haggart); August 1st-15th, 1898, at the Lands End (Gardner); August 9th and 11th, 1898, at Lyme Regis (Tetley); August 25th, 1898, at Greenhithe (Image); September 3rd, 1898, at Wendover (Rowland-Brown); May 28th, 1899, at Reigate (Prideaux); June 3rd, 1899, on Aldbury Down (Barraud); July 20th-August 9th, 1899, near Kinloch (Walker); July 21st, 1899, at Oxtun (Studd); July 29th, 1899, at Betchworth, one only (James); July 30th, 1899, at Malvern (Sich); July 31st, 1899, at Shipley (Bird), and in Denbighshire (Arkle); August 3rd, 1899, at Kimble (Rowland-Brown);

June 4th, 1900, near Tring (Barraud); June 4th and 16th, 1900, at Guildford (Pickett); June 5th, August 4th, 1900, at Marlow (Clark); June 6th, 1900, at Horsley (Kaye); June 9th, July 28th, 1900, at Reigate (Prideaux); June 18th, 1900, at Stroud (Davis); end of June, 1900, at Hailsham, worn out (Carr); July 24th, 1900, in Denbighshire (Arkle); August 14th, 1900, at Dartmouth (Bankes); middle of August, 1900, at Folkestone (Pickett); May 25th, 1901, on Aldbury Down, August 24th, 1901, at Cassiobury (Barraud); May 27th, 1901, at Marlow (Clarke); May 28th, July 24th, 1901, at Reigate (Prideaux); June 14th, 1901, on the North Coast of Cornwall (Rollason); August 7th, 1901, at Rugby (Sidgwick); August 8th, 1901, at Watford (Arkle); August 9th and 25th, 1901, at Cuxton (Burrows); August 19th, 1901, at Ventnor, August 21st, 1901, at Sandown (Gardner); June 7th, 1902, at Reigate (Prideaux); June 11th, 1902, at Banstead (Turner); June 27th, 1902, on Aldbury Down (Barraud); July 8th, 1902, at Marlow (Clarke); August 16th, 1902, at Burgess Hill (Dollman); August 25th, 1902, at Mucking, August 27th, 1902, at Cuxton (Burrows); September 3rd, 1902, at Allington (Wynne); June 2nd, 1903, at Folkestone, just emerging, August 12th, 1903, at Dover, just emerging, August 22nd, 1903, at Folkestone, very fresh (Pickett); June 5th, 1903, August 23rd, 1903, at Reigate, June 10th, 1903, at Wye, just coming out (Kaye); July 18th, 1903, at Sledmere, common (Tetley); August 22nd, 1903, in the Isle of Purbeck (Bankes); August 23rd, 1903, at Mucking (Burrows); September 4th, 1903, at Reigate (Hodgson); May 29th, 1904, at Reigate, July 26th, 1904, at Dorking (Prideaux); June 8th, 1904, at Ashdown, July 14th, 1st brood, and August 3rd, 1904, 2nd brood, Reigate, September 10th, 1904, at Dover (Hodgson); June 17th, 1904, at Blandford, (Bankes); June 26th, 1904, at Pendine (Barker), July 6th-12th, 1904, at Wither Slack (James); July 18th, 1904, at Montrose (Duncan); July 30th, 1904, in Wharfedale, one only (Tetley); beginning of August, 1904, on the Fife coast (Harrison); August 7th-10th, 1904, in the Isle of Purbeck (Bankes); August 29th, 1904, at Mucking (Burrows); May 26th, 1905, at Reigate, July 8th, 1905, near Brighton, August 6th, 1905, at Clandon, September 17th, 1905, at Lewes (Hodgson); May 27th, 1905, at Reigate (Prideaux); June 4th, 1905, at Folkestone, just emerging (Pickett); June 23rd, 1905, at Buckfastleigh (de la Garde); July, 1905, on the Durham coast (Rothschild); August 15th, 1905, at Dorking (Oldaker); August 24th, 1905, on Aldbury Down (Barraud); September 24th, 1905, at Painswick (Watkins); May 30th-June 20th, 1906, at Reigate, August 12th, 1906, at Clandon, September 11th, 1906, at Wrotham (Hodgson); June 17th, 1906, on Aldbury Down (Barraud); July 16th, 1906, near Newbury (Hopson); August 14th, 1906, at Arnside Knott (Arkle); August 30th, 1906, at Reigate (Chapman); September 3rd, 1906, at Ashford (Wood); May 29th, 1907, at Lewes, July 23rd, 1907, at Dover, 1st brood, beginning of August, 1907, 2nd brood, October 12th, 1907, at Reigate (Hodgson); June 8th, 1907, at Horsley (Turner); August 10th, 1907, in Denbighshire (Arkle); May 27th, 1908, at Lewes, August 7th and 8th, 1908, at Reigate, on chalk and sand respectively, and on into October (Hodgson); May 28th, 1908, at Chipstead, June 14th, 1908, at Chatham (Turner); May 24th, 1909, at Abbott's Wood (Alderson);

end of May, 1909, at Southsea and Ventnor (Sperring); June 27th, 1909, at Lewes, August 11th, 1909, at Reigate, September 20th, 1909, at Folkestone (Hodgson); August 6th, 1909, at Kinloch Rannoch (Jackson); September 11th, 1909, at Folkestone, one newly emerged (Bell); June 4th, 1910, on the Chilterns (Rowland-Brown); June 19th, 1910, at Folkestone, two only (Bell); July 9th, 1910, on Nigg Sutor, August 8th, 1910, at Tarbat Ness, worn (Jackson); July 12th, 1911, at Braemar (James); September 30th-October 3rd, 1911, at Birchington (Bernhard Smith).

**HABITATS.**—The habitats of this species are as varied as those of *Polyommatus icarus*. In Britain, as elsewhere, they include hillsides, especially in chalk and limestone districts, open meadows, disused quarries, sandhills, seaside cliffs and narrow valleys running down to the sea, heaths, open downs, cornfields, marshy spots both in flat and hilly country, roadsides, railway banks, the borders of woods, and even the woods themselves, especially at the side of grass rides or in clearings where flowers abound, and occasionally gardens. It is however far less abundant\* and more local than the last species, and in districts where the larva feeds on *Helianthemum*, it seems to be confined to the spots in which the plant is found. Amongst other statements to this effect may be quoted a communication made by Dr. Jordan to the Zoologist so far back as 1844. He says: "I took it in considerable plenty in Bradley Woods, near Newton, Devon, settling on the flowers of *Helianthemum vulgare*, though I did not see a single specimen till I came to the rock where this plant was growing." Wailes, who quotes the above passage, also gives extracts from letters written to him by Cooke and Gregson, the former of whom, writing from Brighton, says: "I have never taken *agestis* except in localities where the *Helianthemum* grows freely," while the latter, who had collected the species in North Lancashire, Cheshire, Derbyshire, Yorkshire, Lincolnshire and Wales, makes the same observation in practically the same words. Similarly Walker, who used to take it on a rocky limestone hill overhanging the Talargoch mine, and on rocky ground about three miles from Holywell (Flint), remarks that at Rhyl and Prestatyn, where *Erodium cicutarium* abounds on the sandhills, there are no *medon*. "So closely" he adds "does this insect stick to the spot where *Helianthemum* grows, that in an open place, about 200 yards from the small space where it is found, which swarms with *Aphantopus hyperanthus*, *Argynnis aglaia* and *Polyommatus icarus*, I have never seen a single specimen." This species frequently shows a predilection for rocky ground. Jordan

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\* I have taken this species in central and southern England, on the French Riviera, throughout Switzerland at all altitudes at which it occurs, and in many localities in northern and central Italy, but I have never seen as many as half-a-dozen specimens at a time, unless possibly at Sulmona;—a great contrast to the numbers in which *Polyommatus icarus*, *Agriades coridon*, *A. thetis*, *Plebeius argus* (*aegon*), and *Cupido minimus* may be seen both in England and abroad, or *Plebeius argyrognomon*, *Latorina orbitulus*, *Hirsutina damon*, or in some few places *Cupido osiris* (*sebrus*) and *Polyommatus eros* in Switzerland, or *P. argus*, *P. argyrognomon*, *Polyommatus meleager*, and *Scolitantides baton* in many parts of Italy. There are, of course, many records of the present species being found in abundance, but I cannot believe that my experience, spread over many years and a wide area, can be unique.—(G. W.).



reports it from Devonshire as frequenting rocky places in woods; both Whittaker and Bath found it on the Cheddar Cliffs; Arkle watched, but was unable to take it, in Denbighshire "on a limestone precipice where the débris had lodged, where there was a wealth of flowers of all colours and these butterflies came sailing up, a dozen at a time, to taste the sweets, with *Pyrameis cardui*, *Hipparchia semele*, and others." The same entomologist refers again elsewhere to the preference of this species (like so many other "blues") for chalk or limestone, when he speaks of it as occurring in Flintshire "among the flowers and grasses of the carboniferous limestone," and Goodwin observes that in the Maidstone district it is common on chalk but scarce elsewhere. So, again, Rothschild reports it from the chalkdowns near Tring, Wheeler from the White Horse Hill above Uffington in Berkshire, and from Gomshall on the North Downs, and we have frequently taken it ourselves on the chalk hills near Rochester, and elsewhere on the North Kentish hill-sides where it haunts the borders of the woods. Rowland-Brown records that on the Chilterns it is to be found on the summits among the scrub and beechwoods. Nash also remarks that it occurs high up on the Cotswolds near Stonehouse, while Griffiths finds it on the hillsides at Dursley, and Davis specially notes its occurrence in dry situations near Stroud, on hillsides, banks and pastures. Similar are the habitats recorded by Turner "on the open leas above Horsley," by Milburn, "on dry banks at Richmond, Yorks," and by Wingate, in Scotland "on the steep grassy side of Dumyot above Blair Logie," where he remarks on the difficulty of capture on account of the extreme dryness of the hillside. But others of its habitats are the extreme opposite of these. Hall, for instance, records that it was "very abundant in Dovedale during the last week in May, 1880, in a very limited locality on the marshy side of a hill, fluttering among the rank grass," with *Polyommatus icarus* and *Coenonympha pamphilus*; so too Stewart reports it "on marsh plants on the Braes of Gowrie, near Kilspendie," and Walker "on a boggy place on the banks of the river Tummel close to Kinloch"; dampness in its surroundings is also distinctly implied by Miss Jackson when she speaks of it as "flying among rushes in a sunny meadow near Kinloch Rannoch," by Duncan when he states that "in the gullies among the cliffs at Montrose it is sometimes found commonly resting after 4 p.m. on the flowers of the common rush," by Morton, who describes it as "common on a *Helianthemum* bank in Glen Lochay by the side of a small burn," by Arkle, who takes it at Witherslack "on the mosses," and probably also by Rose when he writes that "about two miles beyond the Bridge of Gany, as one approaches the Tummel Valley, in a beautiful glade of birches leading down to the river, which was foaming, splashing, and eddying against the rocks, *artaxerxes* is to be found. Different again are the habitats quoted by some other entomologists; Wynne, for instance, found it at Allington, in Lincolnshire, in a large twenty-acre grass field; Lucas in the rides of a wood at Watlington, Oxon; Atmore near King's Lynn on heaths; while Clarke mentions that formerly it was by no means uncommon on the railway bank at Wormwood Scrubs! Almost all these localities are inland, but it is as a coast species, more particularly in the north, that *medon* is most abundant, and here it is as partial to the sandhills as to the chalk-

cliffs. We have found it in as great abundance on the sandhills at Deal as on the chalk-downs at Kingsdown, St. Margaret's and Folkestone; Brameld reports it from the sandhills of Norfolk and Lincolnshire; Barrett records it as common on the sandhills at Pembroke, and Renshaw on sandy ground at Llandudno among thistles, teasles, and low herbage. Whittle reports that it was *the* butterfly on August 3rd, 1896, on the sea-wall on Canvey Island. It is in Durham and Scotland, however, that its coast-loving propensity is most remarkable, particularly in the former. Robson observes that here it "occurs on the coast, extending up the Denes almost as far as they run," while Maddison states that "at Castle Eden it never occurs more than 100 yards from the sea, though the *Helianthemum* grows plentifully at some places inland.

Abroad its habitats do not differ noticeably from those in Britain, and are at least as varied. Lambillion says that in Belgium it is specially common in the limestone districts, and the same preference for chalk or lime is noted by Rössler in Nassau, by Gillmer on the Veronikaberg in Thuringia, and by Speyer in Waldeck, though in the latter case schizt is also mentioned, and sunny and grassy places specified, whilst its absence from sandy localities is remarked upon. On the other hand, in Mecklenburg sandy ground is stated by Schmidt to be preferred, especially the sand-dunes of the coast on the peninsula of Wustrow. Elsewhere in Germany artificial embankments are frequently mentioned as favourite spots of this insect, *e.g.*, those of the fortifications at Danzig (Rastenburg), and of the Fort Prussia in Pommerania (Schulz), and the railway banks at Waren (Busack), and across the Mosigkauer Haide (Amelang); a somewhat similar locality is the sloping bank of the river Elde between Parchim and Möderitz which is mentioned by Gillmer, whilst Dadd took it in the Oythal "on a fine sunny bank, alive with butterflies, at the junction of the Oy and the Trittach." The latter entomologist also mentions woods at Spandau, near Berlin, as a locality for this species, and similar spots are mentioned by many German writers especially clearings or meadows situated in woods. Thus Stange gives dry sunny pastures and wood-clearings at Friedland; Dickoré, wood-clearings at Giessen; Glaser, grassy flowery dykes and sunny clearings near Worms; Fischer, wood-clearings at Wernigerode; Kolb, woodland fields at Kempten; Wocke, dry places in woods and the edges of fields in Silesia. Dry places, again, are specially mentioned by Gillmer in the Mosigkauer heath, particularly when these were bordering on meadows. In Pommerania, according to Wocke, the insect is confined to grassy open spots, whilst dry flowery places are designated by Schmidt as its habitat round Wismar. Prideaux took it at Wiesbaden "on rough broken ground," and Becher by the side of the Marienbad road at Carlsbad. In France, except in the Alpine region its habitats are generally much the same as in England, though one or two spots may be mentioned. Oberthür records that although this species is very scarce at Rennes, yet it is by no means uncommon on the grass plots of his garden at Cancale which overlooks the sea; we ourselves, again, have taken it on the black mud at the side of a small stream at Digne, where it settled with swarms of *Agriades coridon* and many examples of *Polyommatus icarus* and *Scolitantides baton*. In the Channel Islands Luff records it from



the coast cliffs, while Hawes particularly notes its occurrence in marshy spots in St. Brelade's Bay, Jersey. Its habitats in the Alpine regions of France, Italy, Austria, South Germany and Switzerland are similar throughout, though of the most varied description. We have frequently taken it at moist places on the roads and pathways, sometimes sparingly and sometimes in abundance. It occurred, for instance, in hundreds about 3,000ft. above Bourg d'Oisans at all the little runnels that crossed the pathway, in company with *Agriades coridon*; at the little puddles on the footpath between the village of Evolène and the river; on damp patches on a path on the Ofen Pass, with *Plebeius argus* (*aegon*) var. *killiasi*, *Cyaniris semiargus*, *Hirsutina damon*, *Agriades coridon*, *A. thetis*, *Polyommatus eros* and *Aricia donzelii*; at a spring above Lavin with *Plebeius argus*, *P. argyrognomon*, *Vacciniina optilete*, *Hirsutina damon*, *Cyaniris semiargus*, *Agriades coridon*, and *Erebia aethiops*; we found a few at the little runnels in the Dischmathal, while it swarmed at the puddles and runnels on the waste ground just above Abriès, with *Hirsutina damon*, *Polyommatus escheri*, *P. hylas*, and *Plebeius argus*; and we met with it again in a similar spot on the flats half-way between Bobbie and the Pellice Falls, with *Agriades coridon*, *Polyommatus escheri*, *P. hylas*, *P. icarus*, and occasional *P. eros* and *Hirsutina damon*, and in many other like situations. We have taken it also, among other places, on waste lands on the foot hills of the Jura near the lake of Geneva; at the edge of the pinewood below the Kurhaus at Arolla; on the outskirts of another pinewood at Brugnasco, at 4,500ft., where it flew with *Plebeius aegon*, *Parnassius apollo*, *Leptosia sinapis*, *Brenthis amathusia*, *Argynnis aglaia*, *A. niobe*, *Erebia goante* and *Melanargia galathea*; in flowery hollows below Lavancher, and sparingly on flowery slopes at le Lautaret, and also between Allos and the Lac d'Allos, at nearly 7,000ft., on a delightful stretch of a heath-like or moorland character. Amongst other habitats in Switzerland we may mention that Wheeler records it from the roadside between Sion and Vex, and also sitting on the grass heads, on a dull day, by the side of the watercourse above Faido; Tetley found it on the railway banks at Sion in company with *Plebeius argus*, *P. argyrognomon*, *Celastrina argiolus*, *Everes alcetas*, and *Melitaea aurelia*; whilst Mrs. Page reports it from the banks of the Naviganza at Zinal, and Sheldon from the flowery meadows below the village of Simplon. It occurs also in the Pyrenees, and Standen speaks of it in a hot corner about a mile from Vernet along the road to Castell,—“a hollow bend of the road, sheltered from any breeze that might be stirring,” where he found it with a crowd of other species. Among its Spanish haunts a few may be noted. At Gibraltar Becher reports that it occurs on the rock itself, while Sheldon records it from Algeciras as occurring in the cork woods, and Lang from Andalusia in a small forest of gigantic umbrella-pines. Chapman took it “on the upper Jucar stream near Tragacete, in patches which had gone for a year or two out of cultivation, amidst thousands of specimens of many species.” Sheldon (*Ent. Rec.*, xviii., p. 58) gives a most inspiring account of another of its haunts, too long, however, for quotation,—a gorge about a mile east of La Granja, where this species was accompanied on July 19th by the whole fauna of the neighbourhood, including *Dryas pandora*, *D. paphia* var. *immaculata*,

*Argynnis adippe* var. *chlorodippe*, and ab. *cleodippe*, *Melitaea phoebe* var. *occitanica*, *Heodes virgaureae* var. *miegii*, *Lampides boeticus*, *Nordmannia ilicis* and var. *aesculi*, *Klugia spini* and ab. *lynceus*, *Melanargia japygia* var. *cleanthe*, *M. lachesis* and ab. *catalenca*, and many others. (The *Brenthis hecate* that he mentions have since been shown to be *B. selene* var. *castiliensis*, but the similarity, owing to complete absence of silver beneath, is very striking). In Algeria and Morocco Meade-Waldo reports it as being abundant at all levels and "simply swarming in some of the woods." In the large Mediterranean islands, though occurring, sometimes freely, inland, it seems to be most abundant as a coast species. In Italy its habitats are as varied as elsewhere. Wheeler reports that in addition to its alpine localities he has taken it near Sulmona "in a small field at the foot of the hills just below a dry stony watercourse," at Subiaco on the site of Nero's Villa, in a deep but narrow miniature gorge near Palena station, which was watered by a tiny stream, and at rest, in the late afternoon, on the cornstalks and bents, on the top of a dry parched hill above Roccaraso, where it was by far the least common of the *Lycænids* present, the other species being *Polyommatus icarus*, *P. hylas*, *P. meleager*, *P. eros*, *Agriades coridon*, *A. thetis*, and, most abundant of all, *Plebeius argus* (*aegon*). He further notes that below Assisi, where a cart-track ran between flowering patches of vetch on the one side and the stubble of reaped cornfields on the other, whilst other species swarmed at the vetch, the very few *A. medon* which he found were confined exclusively to the stubble. Mathew relates that during the first half of September, 1897, this species was "common on a hillside between Trieste and Miramar, the ground being covered with scrub-oak, Spanish chestnut, heath, juniper, and thorn; the heath being in bloom, with many other attractive flowering plants, and butterflies being in great numbers." De la Garde mentions a curious habitat, *viz.*, Malamocco, a very elevated sandbank, outside the canal entrance to Venice. In Bulgaria Mrs. Nicholl took this insect at Slivno, in a rough valley among the vineyards, at the end of May, together with *Pontia daplidice*, etc., and at the end of June it was one of fifty-two species in a famous "butterfly corner" in the Rilska Valley, about three miles above the monastery. In Roumania Fleck specially notes meadows and mountain slopes as its favoured haunts. From Russia we have very few records of its special habitats. Young, however, mentions the Yaila Dagh, above Yalta, in the Crimea; Eversmann states that it occurs "in grassy places" in the Governments of Kasan and Orenburg, and Assmuss says that near Moskaïsk, in the Government of Moscow, it is found in meadows near woods. In Finland, also, Federley reports that it occurs in meadows. With regard to its Asiatic haunts, again, we have practically no information. The only exception is Syria, the records from which are unusually full. Mrs. Nicholl took this species above Jedidah on the barren hill-sides, and between Zebedani and Racheya she records it both on the Damascus road, along the banks of a brook flowing through a green valley, and also in the dry watercourses and stony cornfields, where it occurred with *Polyommatus amandus*, *P. candalus*, *Aricia isaurica*, *Nordmannia myrtale*, *N. ilicis* var. *cerri*, *Chrysophanus ochimus*, *C. thersamon* var. *persica*, *Melitaea phoebe*, *M. trivia*, *M. didyma*, and other species. Graves has taken it near Damascus in a large ill-kept

garden, on limestone, outside the town, and on the wooded railway banks at Dumar, which were covered with flowering crucifers. In the Lebanon he observes that pinewoods are its favourite haunts, while in the more barren Anti-Lebanon, with its drier and hotter climate, grassy and bushy places are preferred. At Aleih, in the Lebanon, he found it on a slope above the station covered with trees and brushwood, and at Bludan, in the Anti-Lebanon, on hillsides and gardens in the village.

**DISTRIBUTION.**—This species seems fairly distributed over England, the greater part of Wales, and most of Scotland except the extreme north, as we have records for all the English counties and most of the Welsh and Scotch; we strongly suspect moreover that it will eventually be recorded from the rest, or, at any rate, from nearly all of them. Widely distributed in this island as it is, it must be regarded as one of our more local species; there are many apparently suitable places where it is not found, and many where its favoured localities are of very limited extent. In the south it is usually common, both on the coast and on the inland downs, as far west as Devonshire, but becomes scarcer in Cornwall, though extending to the Lands End; it occurs commonly in the Chilterns and is by no means scarce in the Cotswolds; though very local in the north it occurs in some places in abundance as a coast species, especially in Durham and Northumberland, Fife, Forfar and Kincardineshire; it is scarcely less frequent on the coasts of Aberdeen and has been taken as far north as Nigg Sutor, on the Frith of Cromarty, and at Tarbat Ness in the north of the county of Ross, and is widely distributed in Perthshire. There are as yet no records from Sutherland or Caithness, but it is by no means unlikely that it occurs on the east coast of these counties at any rate. The western coast is not so much favoured by it as the eastern, and it is not, like *Polyommatus icarus*, an island species though it has been taken on the Isle of Islay. It is of frequent occurrence also in the Isle of Wight, but the other islands from which it is recorded, Anglesey, Purbeck, Thanet, Sheppey, Canvey, Osey, etc., can either barely make good their claim to the name, or are at most cut off from the mainland by the narrowest channels. Though scarce, and even more local in the west, it occurs on the sea-board of Ayr, Wigtown, Kircudbright and Dumfries, is fairly common in the coast-region of Furness, both in Lancashire and Westmorland, occurs in all the Welsh counties whose shores face the north or the south, and is reported by South as abundant in the extreme south west corner of Wales. In the midlands, except, as mentioned above, in the Chilterns and Cotswolds, it is generally scarce and local, though in a few instances plentiful where it occurs. In Ireland the only modern record seems to be from Clonbrook in Galway where it appears to occur every year in the *artaxerxes* form, though Birchall formerly recorded it from Dundrum near Dublin, and from the Mourne and Wicklow mountains, and there is a specimen, also of the *artaxerxes* form, in the Brit. Mus. coll., from the Frey coll., labelled "Dublin," but without any further data. A remarkable instance of this species appearing suddenly over a considerable area in Essex was reported by Harwood, who wrote as follows:—"This has recently become one of our commonest butterflies; previous to 1896 it was quite a rarity in the neighbourhood of Colchester, but in that year

thousands of specimens might have been taken." The follow list of British localities is doubtless incomplete:—

ABERDEEN: (Newman), very common on the south coast (Horne), Pitcaple (Salvage), Alford (McLean), Braemar (Buchanan White), Inverurie (Tugwell). ANGLESEY: north side of the island (Baynes). ARGYLL: Islay (Jones.) AYR: local and not common; Loch Doon (Duncan), on the coast between Girvan and Ballantrae (Ord), Newfield (Scott), Toon (Dalgleish). BANFF: (Brown). BEDS: Bedford, on the hills (Barrett), Barton hills near Luton (Nash). BERKS: north Berks, common (Galpin), Newbury (Kimber), Streatley (Bull), Ashbury, White Horse Hill (Wheeler). BERWICK: St. Abb's Head (Black), Dunse (Burder). BUCKS: Marlow (A. H. Clarke), Stoney Stratford, rare (Foddy), Wendover (Warren), Kimble (Rowland-Brown), High Wycombe (Ullyett). CAMBS: Cambridge (Crisp), Burwell (Norgate), Boxworth (Thornhill). CARMARTHEN: Pendine (Barker). CARNARVON: Llandudno (Renshaw), Gloddeath, common on hills at Colwyn Bay (Newstead), Little Orme (Imms), Orme's Head, sandhills at the mouth of the Conway (Gardner). CHESHIRE: Delamere Forest (Arkle). CORNWALL: Newquay, Truro (Rollason), near Polperro (Perrycoste), Land's End (Gardner), Trevalga (Riding), Perranporth, Carbis Bay, Praa Green, Penzance, Godolphin, but nowhere common (V. C. H.). CUMBERLAND: rather rare, Keswick (Beadle). DENBIGH: The Leet (Arkle), along the Clwydd Hills, Cefn Caves, near Ruthin, near Llandrillo-yn-Rhos (Gardner), Bryn Euryn (Imms), Llandulas (Campbell). DERBY: near Ashbourne, Dovedale (Hall), Monsal Dale, Lathkill Dale (Payne), Millar's Dale (Jourdain). DEVON: Buckfastleigh (de la Garde), Teignmouth (Rogers), Torquay (Crocker), Seaton (Prideaux), Exeter, common (Pope), Dawlish (Rawlinson), Whitsand Cliffs, Bovisand, Turnchapel, Cremill, Plymbridge, Looe, Axminster (Reading), Instow, Barnstaple, Braunton Burrows, Bolt-Head (Mathew), Oxtou (Studd), Kingsbridge (Merrin), Morthoe (Riding), Dartmouth (Bankes), Paignton (Goodall), Dartmoor (Leach). DORSET: common, sometimes abundant on the East Dorset downs, Blandford, Purbeck (Bankes), Lyme Regis (Tetley), Sherborne (Douglas), Hod Hill (Fowler), Cranbourne (Nelson), Lulworth (Green), Swanage (Hall). DUMFRIES: Moffatt, near St. Mary's Loch (Somerville). DURHAM: common locally along the coast (Harrison), Hartlepool (Harvey Jellie), Castle Eden Dene (Dewar), between Blackhalls and Seaham Harbour (Robson). EDINBURGH: Arthur's Seat (Hodgkinson). ELGIN: Buchan (Gordon), Forres (Salvage). ESSEX: Southend, Walton-on-the-Naze, Brentwood, Mucking (Burrows), Hazeleigh, Warley (Raynor), Witham (Burnall), Canvey Island (Whittle), Purleigh, Osey Island (Fitch), near Colchester (Harwood), Leigh (Turner). FIFE: common on the coast (Harrison), Orrack Hill (Syme), Cupar (Brown). FLINT: near Holywell, wood near Llyn Helig, Talargoch near Rhyl (A. Walker). FORFAR: Bervie, Montrose, St. Cyrus (Gunning). GLAMORGAN: Cardiff, not common (Ansaldo), on the coast at Font-y-Gary, near Llandaff (Fowler), Swansea (Robertson). GLOUCESTER: Bristol (Vaughan), Cirencester, rare (Harman), Rodborough Hill (Harrison), Stroud (Davis), Painswick (Watkins), Leckhampton (Trye), Lower Guiting (Greene). HANTS: Horndean district, rare (Hawker), Bournemouth (Nash), Southsea (Sperring), Portsmouth (Newman), Portsdown Hill (Pearce), Burghclere, New Forest (Alderson), Ringwood (Corbin), Basingstoke (Hamm), Winchester (Dart), Aldershot (Tulloch); Isle of Wight—Bembridge (Oldaker), Ventnor, Sandown (Gardner), Shanklin (Trimen), Whippingham, abundant (James), near Ryde (Jordan). HEREFORD: near Hereford (Blathwayt). HERTS: Hertford (Stephens), Tring, Berkhamstead (Rothschild), Aldbury (Gibbs), Hitchin (Durrant), Royston (Wheeler), Bricket Wood (Perkins), Watford (Spenser), Haileybury (Bowyer), Pitstone Hill (Elliman), Cassiobury (Barraud). HUNTS: St. Ives (Norris). KENT: Folkestone (Hall), Cuxton (Burrows), Broadstairs (Bird), Chatham (de la Garde), Ashford, Dover (Wood), abundant on sandhills at Deal and chalkdowns at Kingsdown and St. Margaret's (Tutt), between Dover and Sandgate (Cox), Shoreham, Chelsfield (Fenn), Walmer (Shepherd), Ramsgate (Powell), Maidstone (Goodwin), Shorncliffe (Rogers), Herne Bay, very common (Butler), Otford (Battley), Wye (Kaye), Isle of Thanet (Willson), Isle of Sheppey (Fletcher), Greenhithe (Image), Wrotham (Hodgson), Hythe (Newman), Eynsford, Strood, Halstead, Chattenden (Turner). KINCARDINE: Muchalls (Sinclair), Stonehaven (Dalgleish), Ran Hough (Thomson). KIRCUBRIGHT: between Minnithive and Carsphairn, common (Forbes). LANCASHIRE: local; Morecambe Bay (Hodgkinson), Carnforth, Silverdale, Yeland, Warton (Murray), Grange (Crabtree),

Chat Moss (Edelsten), Witherslack (James), near Manchester (Newman). LINCOLN: hillsides in Lincolnshire (Brameld), Lincoln district (Burton), Allington (Wynne), formerly in the Louth district (Bailey). MIDDLESEX: Mill Hill (South), Isleworth (Myers); formerly at Grim's Dyke, last seen 1901 (Rowland-Brown), formerly common at Wormwood Scrubs (A. H. Clarke). MONMOUTH: Pontnewydd (Conway). NORFOLK: on the hillsides of Norfolk (Brameld), Norwich, Hunstanton, King's Lynn, Merton, Thetford, Broom Heath (Barrett), Sparham (Norgate). NORTHANTS: Northampton (Goss), near Peterborough (Morley), Towcester (Clark). NOTTS: Mansfield (Smith). OXFORD: Oxford (Blackburn), Watlington (Lucas), Shotover (Geldart), Wychwood Forest (Bull), Enstone (Cruttwell), Charlbury, very common (Sanders), Chinnor (Spiller), Stonesfield (Stretch). PEEBLES: (Black). PEMBROKE: Tenby (Puckridge), Pembroke (Barrett), Castlemartin (Hodge). PERTH: Glen Lochray (Morton), Dunsinane Hill, Glen Tilt (Buchanan White), Kinfauns, Braes of Gowrie near Kilspindie (Stewart), Moncrieffe Hill, scarce and local (Moncrieffe), Rannoch (Cockayne), Pitlochrie (James), Kinloch (Walker), half-way between Callander and the Trossachs, near Loch Earn (Lovell-Keays), Bridge of Allan (Paterson). ROSS: Nig Sutor, Tarbet Ness (Jackson). ROXBOROUGH: Ancrum, Hawick, Jedburgh (Renton), Crossford Castle (Elliott). RUTLAND: Uppingham (Bell). SALOP: Shrewsbury (Newman). SELKIRK: Galashiels (Haggart). SOMERSET: Taunton (Tetley), Cheddar (Bath), Croscombe, Burford, locally common (Bogue), Weston-super-Mare (Crotch), Wells (Troupe). STAFFORD: some years abundant in the Valley of the Dove (Masefield). SUFFOLK: Bentley (Burrows), Cavenham (Rothschild), Stowmarket (Baker), Downham, Barham (Norgate), Brandon (Fenn). SURREY: Reigate (Tonge), Gomshall (Wheeler), Guildford (Grover), Dorking, Ranmore, Polesden (Oldaker), Croydon (Hall), Clandon (Hodgson), Caterham (Morris), Riddlesdown (Fletcher), Box Hill (Turner), Betchworth (James), Purley, Oxted (Sheldon), Hog's Back, Albury Downs, Horsley, Sheep Leas (Champion), Chipstead, Banstead (Carr), Kenley (Carrington), Bagshot (Floersheim), Godstone (Stainton). SUSSEX: Hastings, Rye, Worthing, Littlehampton, Chichester (Newman), Eastbourne (Sotheby), Steyning (White), Shipley (Bird), Lewes (Hodgson), Brighton (Hind), Burgess Hill (Dollman), Hailsham (Carr), Newhaven (Reeve), near Bognor (Trimmen), Abbot's Wood (Alderson). WARWICK: not common; near Birmingham (Morris), Rugby (Sidgwick), Welford (Wheeler). WESTMORELAND: fairly common from Kendal to Witherslack (Moss), Arnside Methop (Forsythe), Cunswick (Littlewood). WIGTOWN: Stranraer (Gordon). WILTS: Wishford near Salisbury, near Wilton (Carr), Savernake (Kimber). WORCESTER: Worcester (Newman), Malvern (Sich), Bredon, Oddingley, Broadway (Fletcher). YORKS: local; near Sledmere, common, Grasswood, Wharfedale (Tetley), Ledsham (Taylor), Grassingham (Carter), Richmond (Sang), Scarborough (Tyers), Boston Spa (E.W.I.), Redmere (Yorks Nat. Union). IRELAND.—[DOWN: Mourne Mtns. (Birchall). DUBLIN: Dundrum (Birchall).] GALWAY: Clonbrook (Dillon). [WICKLOW: Wicklow Mtns. (Birchall).] Birchall's records are considered doubtful, but in the light of the undoubted modern records from Galway, they are probably correct.

The foreign distribution of this species follows much the same general lines as that of *Polyommatus icarus*, not, however, extending quite so far north, but, on the other hand, stretching considerably further east. In fact, without taking note of the doubtful *chinensis*, Murray, its range is only bounded by the Atlantic on the West and the Pacific on the East, for it extends from Tromsö, Galway, Portugal and the Canaries to the Island of Askold in the Bay of Vladivostock. Its southern limit is practically the same as that of *Polyommatus icarus*, but it only occurs exceptionally further north than 66° 40'. Its occurrence, however, is by no means so unbroken as that of the last species, there are considerable tracts of country from which we have no record of its appearance, and in many parts where it occurs, over a great part of Germany for instance, it is scarce and local. Here and there, on the contrary, especially in mountainous districts it occurs in abundance and is reported as very abundant at all elevations in Morocco. It reaches a higher altitude than *P. icarus*, for Grum-

Grshimailo took it on the Kounjout mountains, in the Pamirs, at an elevation of more than 14,000ft.; in the European Alps also its range is somewhat higher, since it is by no means limited to an altitude of 7000ft. a point to which *P. icarus* rarely ventures. The following list of localities, gathered from many sources, is no doubt incomplete, but will give a fair idea of its recorded distribution.

**AFRICA:** Algeria—Lambessa, Collo. (Oberthür), Guelma (Baker), Tlemcen (Gibbs), El Kantara, Constantin (Meade-Waldo), Biskra (Nicholl), Tunis (Staudinger); Canary Islands—Teneriffe (Holt-White); Morocco—Tangier, Ouad Moorbey, Imentella, Marrakesh, Meduna (Meade-Waldo).

**ASIA:** Asia Minor—Marmarice, shores of the Sea of Marmara (Mathew), Gyök-su, Erenkeui (Graves), Angora (Hofmann), Amasia (Fountaine), Cilicia (Holz), Broussa, Denizli, Patara, Makri (Zeller); China—near Pekin (Herz); Cyprus (Mathew); India—Kashmir (de Nicéville)—Gurais Valley (Elwes), Kumaon—Naini Tal (Doherty), Ranikhet (Moore), Punjab—Simla, Mandi, Kangra (Brit. Mus. coll.); Pamirs—Kounjout (Grum-Grshimailo); Persia—Teheran, Urumiah, Orchabad (Brit. Mus. coll.); Siberia—Altai—Ongodai (Jacobson), Biisk (Elwes), Amur—Bureja mtns., Ussuri (Maack), Raddefka (Christoph), Sutschan (Dörries), Chabarofka, Pokrofska, Nicholaiefsk (Graeser), Island of Askold (Oberthür), Transbaikal—Witim (Herz); Syria—Beirüt, Hammana (Cremona), Ain Aata, between Zebedani and Racheya, Jedidah, Suk Wady Farada (Nicholl), Damascus, Dumar, Reyak, Bludan, Ain Zahalta, Aleih (Graves); Thibet—Ladak (de Nicéville); Turkestan—Ala Tau—Lepsa (Haberhauer), Dschungaria (Brit. Mus. coll.), Fergana (Brit. Mus. coll.), Sarafschan—Pendshakent, Tsching (Grum-Grshimailo), Sary Ob (Brit. Mus. coll.), Samarkand (Haberhauer), Tekke district—Ashkhabad, Germob (Christoph), Thian-Shau (Alphéraky).

**EUROPE.—AUSTRIA HUNGARY:** Upper Austria, nowhere rare in the mountain valleys (Brittinger)—Reichenau (Hormuzaki), Weinzierl, Micheldorf, Herndl, Schoberstein (Himsl), Linz (Fritsch); Lower Austria—Vienna district (Rossi), Gresten (Schleicher), Hernstein district, common (Rogenhofer); Bohemia (Nickerl)—Karlsbad (Becher), Seftenburgh (Fritsch); Bukovina—Krasna, Czernowitz (Hormuzaki); Carinthia, mostly abundant (Höfner)—Raibl, not rare (Mann), Heiligenblut (Lemann); Carniola—Wippach, common (Mann); Croatia—Fiumé, Josefthal, Vincoveze, Novi (Aigner-Abafi), Podsused, Samobor (Grund); Dalmatia—Lissa (Galvagni), Spalato (de la Garde); Galicia—Janova, Piaszkowy (Nowicki), Oswitz (Neustadt and Kormatzki); Hungary—Budapest (Lang), Promontor Marshes, abundant (Sheldon), Kelenfold (Jones), Herculesbad (Keynes), Peczer, Debreczen, Pécz, Sopron, Pozsony, Kocsócz, Rozsnyó, Gölniczahánya, Eperjes, Mehadia, Orsova, (Aigner-Abafi); Istria—Trieste (Mathew); Moravia, pretty frequent in the forest districts (Schneider)—Brünn (Fritsch); Salzburg—occasionally on the Gersberg and Gaisberg (Staudinger), Salzburg (Fritsch); Styria—near Trieben, Kalbling, Tamischbachturm, Kreuzkogel (Strobl), Udmont district (Kiefer); Transylvania—Brasso, Nagy Sczeben (Aigner-Abafi); Tyrol—Moostal, Neu Spondinig, between Gomagoi and Sulden, Mendel Pass, not common (Tutt), Trafoi to Franzenshöhe (Speyer), Brenner Pass (Rowland-Brown), Pfons, Salfauns and Steinach in the Wipptal, Navis, Mitzens (Galvagni), Botzen, Trient, Glockner distr. (Mann), Popenathal, Beutelstein (Rogenhofer), Innsbruck, up to 6,600ft., common, from Taufers to Knutten, common (Weiler), Schlükenalp, Stellenalp, Waldrast, Alpein (Heller); Vorarlberg—Arlberg (Tutt).

**BELGIUM,** common in the limestone districts (Lambillion)—Grupont (Bath), Rochefort (Carlier), Dinant, Florennes (Derenne), Han-sur-Lisse (Sibille), Boussu-Walcourt (Hennin).

**BULGARIA,** not uncommon between 3,000 and 4000ft. (Elwes).—Kokaleny, Kloster, scarce (Bachmetjew), Mt. Vitoch, Slivno, Rilska Valley (Nicholl).

**CHANNEL ISLANDS:** Jersey, on the cliffs, abundant (Luff), St. Brelade's Bay (Hawes), Guernsey, Sark, Alderney, common (Luff).

**CORSICA:** Ajaccio (Standen), Vizzavona (Jones), Bocognano (Rowland-Brown).

**CRETE:** Suda Bay (de la Garde), Canea (Mathew).

**Denmark—Zealand, Funen and Jutland (Bang-Haas).**

**FINLAND,** not rare up to 60° N., but chiefly in the south-east (Federley).—Nyland (Tengström), Förteck, Alando, Getu, Bolstaholm (Reuter), Finström, Emkarby, Bergö, Grelsby, Mariehamn, Sund, Kastelholm (Poppus), Abö, Korpö, Korpogard (Ringbom).

**FRANCE:** Ain—Gex (Tutt), neighbourhood of Geneva (Rehous); Aisne—St. Quentin, very common (Dubus), Samoussy (Wheeler); Allier—Moulins (Peyerimhoff); Alpes-Maritimes, generally distributed on the mountains and the coast—Auribeau (Tutt), Beaulieu, St. Martin-Vesubie, &c. (Rowland-Brown);

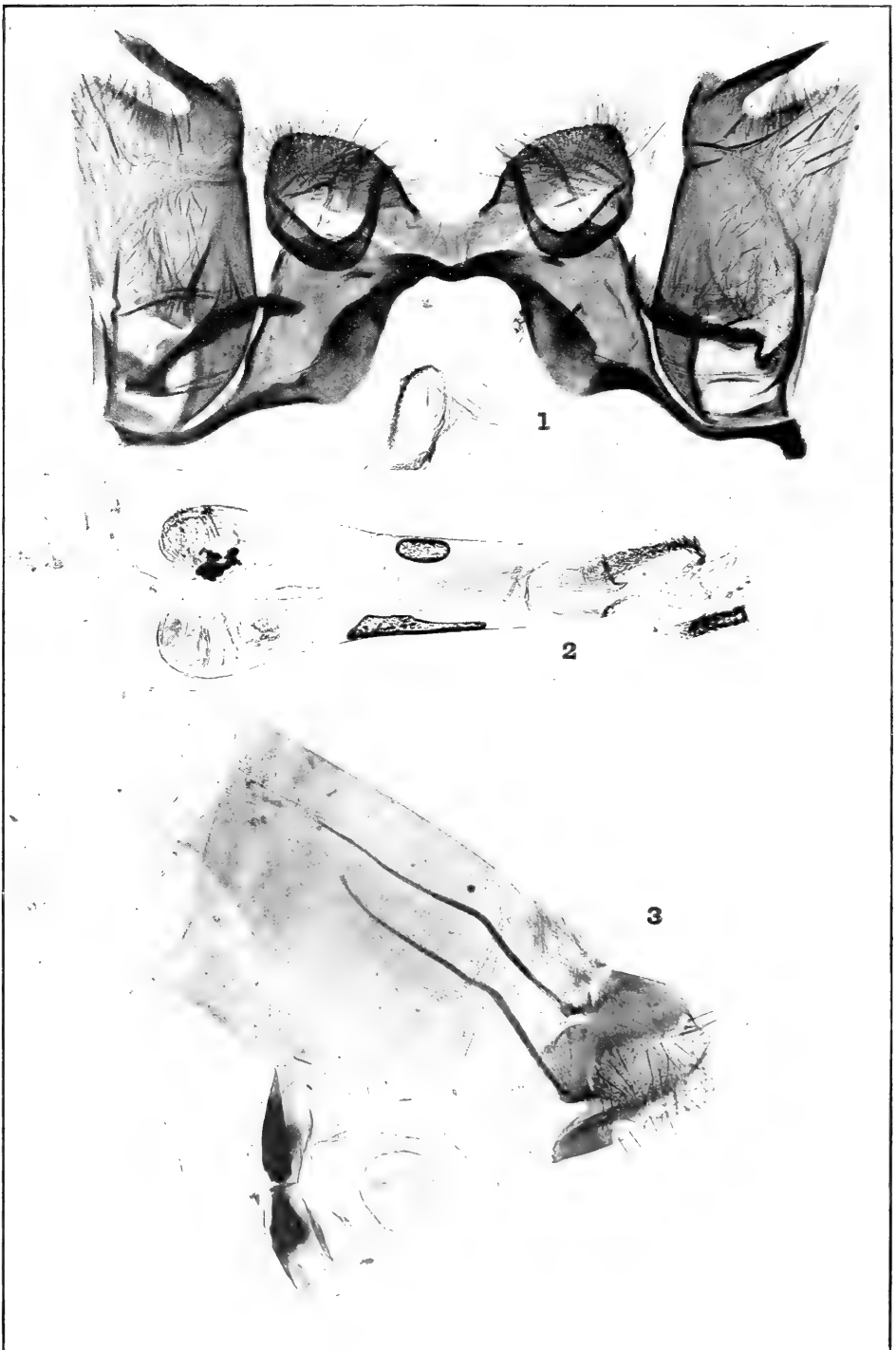


Ariège—Ax-les-Thermes, and up the Ax to Hospitalet (Rowland-Brown); Aube, everywhere (Jourdeheuille); Aude—Axat (Tetley), Carcassonne (Rowland-Brown); Basses-Alpes—Allos distr., scarce (Tutt), Digne (Jones), Larche (Oberthür), Passe de Sucre, Barcelonnette (Rowland-Brown); Basses-Pyrénées—near Bayonne (Larralde), Biarritz (Rowland-Brown); Bouches du Rhône, common (Siepi); Calvados, everywhere (Fauvel); Charente—Angoulême, Puymoyens (Rowland-Brown); Charente-Inférieure—Dompierre-sur-Mer, Île d'Oléron (Mabille); Cher—St. Florent, Sologne (Sand); Deux-Sèvres, widespread (Getin and Lucas); Dordogne, very common (Tarel); Doubs (Bruand); Drôme—Nyons, &c. (Rowland-Brown); Eure, rather common, but never abundant—Pont de l'Arche (Dupont); Eure-et-Loir (Guenée)—les Chatelliers (Oberthür); Finisterre—Morlaix, common (Lauzanne); Gard—Pont-du-Gard (Tutt); Gironde, common (Robert Brown)—Arcachon (Muschamp), Bordeaux (Rowland-Brown), Podensac (Moore); Haute-Garonne (Caradja); Haute-Marne—Langres (Frionnet); Hautes-Alpes—Abriès, le Lautaret (Tutt); la Grave (Lowe); Col du Mt. Genève, Monetier-de-Briançon (Oberthür); Haute-Savoie, throughout (Rowland-Brown)—Le Tour, Argentière, Col des Montets, Grand Salève (Reverdin), Grammont (Muschamp), Megève, Chamouis, Mt. Vuache (Tutt); Hautes-Pyrénées, throughout (Rondou)—Pierrefitte-Nestalas (Jones), Gavarnie (Turner), St. Sauveur (Elwes), Gèdre, Héas, from 1,800-5,500ft. (Bath); Haute-Vienne—Limoges (Samy); Hérault—Cette (Rowland-Brown); Ille-et-Vilaine—Rennes, very rare, Cancale (Oberthür); Indre—Brenne (Martin), Nohant (Sand); Isère—Uriage, and generally (Oberthür), Clelles, occasionally, Bourg d'Aru, Bourg d'Oisans (Tutt), Allevard (Reverdin); Jura—Champagnole (Gibbs); Loire-Inférieure, very common (Deherman-Roy)—Nantes (Oberthür); Loir-et-Cher, everywhere—Blois, etc. (Chevillon); Lozère—Florac, la Caze, Mende, etc., (Rowland-Brown); Maine-et-Loire—Angers, rather common (Cheux), Chaloché (Bonneville), la Ballue (Delahaye); Manche—Cherbourg (Nicollet); Marne—Rheims, common (Demaison); Meurthe-et-Moselle, everywhere (Cantener); Morbihan—pinewoods to the west of Plouharnel (Oberthür); Noid, very common (Paux)—Lille, common (le Roi), Douai, common (Foucart); Oise (Pinart)—forêt de Compiègne (Boisduval); Pas-de-Calais—Wimereux (Moore); Puy-de-Dôme (Sand)—la Bourboule (Prideaux); Pyrénées-Orientales, generally (Rondou)—Sorède (Sprongaerts), Vernet (Standen); Saône-et-Loire—limestone district of Autun, rather rare (Constant); Sarthe (Gnockaert); Savoie—Brides, Champagny-le-Haut, Pralognan, Moutiers (Reverdin), Grésy-sur-Aix, St. Michel-de-Maurienne (Tutt), Lanslebourg, and generally (Rowland-Brown); Seine—environs of Paris (Goosens), La Varenne St. Maur (Ragonet); Seine-et-Marne—Fontainebleau (Ashby); Seine-Inférieure—near Rouen (Oldaker), Sahurs-sur-Seine, St. Aubin-jouxte-Boulleng, common (Viret), Orival (Martel), but generally rare (Noel); Somme—Coigneux, not common (Postel); Var—Hyères, not common (Norris), Bandol, Pardigon (Reverdin), Carqueiranne (Jones), Costebelle, a few (Buckmaster), Draguignan (Segond); Vaucluse—Mt. Ventoux distr. (H. Brown); Vendée, wide-spread (Getin and Lucas); Vosges (Cantener)—Charmes (Gibbs); Yonne, common (Lorifarne). GERMANY: Baden, scarce, except at Friedrichsfeld and Maxau (Spuler)—Konstanz, Isteiner Klotz, Karlsruhe, Heidelberg (Reutti), Freiburg (Warren), on the Turmberg, Maxau (Gauckler); Friedrichsfeld, Wertheim, Weinheim (Spuler); Bavaria—Regensburg (Schmidt), Augsburg, not common (Freyer), Kempten, not frequent (Kolb), Oythal, Seealp (Dadd); Brandenburg—Jungfernheide, Potsdam, etc. (Bartel), Spandau (Dadd), Frankfurt-on-Oder (Kretschmer); Hamburg—Bergedorf, Geesthacht (Zimmermann), Boberg (Laplace); Hannover—Lüneburg, common (Machleidt), otherwise absent from the Province (Gillmer); Hartz and Brunswick, not rare (Heinemann)—Wenigerode, fairly common (Fischer), Quedlinburg, Osterode, Göttingen, rare (Jordan), not rare on the north-eastern slopes of the Harz (Reinecke); Hesse—Mombach, frequent (Rössler), Wiesbaden (Prideaux), Biedenkopf (Jäger), Hanau (Limpert), Cassel (Ebert) Ems (Sich), Frankfurt-on-Main (Koch), Darmstadt, pretty frequent (Schenk), Giessen (Dickoré), Worms, but generally scarce throughout Upper Hessen (Glaser); Lübeck (Paul); Mecklenburg—Sülze, Neu Strelitz, Rülöw, Wismar (Boll), Wustrow peninsula, pretty frequent (Schmidt), Waren (Busack), Schwerin, a single specimen (Schröder), Parchim, singly only (Gillmer); Pommern, everywhere, but seldom common (Hering)—Tantow, not rare, near Warsaw, on the Schwalbenberge (Schulz), Dänholm (Paul), Stralsund, Altfähr, between Bergen and Bootstelle, near Seemühl (Spormann), Grimmen, Splietsdorf (Krüger), Ahrenshoop, one only (Völschow); Posen, everywhere frequent (Schulz)—Lissa (Neustadt and Kornatzki); Prussia (East and West), common

(Siebold)—Dantzig, common, Königsberg, Rastenburg, Lyck, Arys, Graudenz, Zoppot, Ramuck, Allenstein (Speiser); Rhine Provinces—Frankenburg, Ronheide, Seffent, Cornelimünster, scarce, Neuenahr, not rare (Maassen), scarce at Uerdingen, Aix, Cologne, Bonn, Coblenz, Boppard, Bingen (Stollwerck), Krefeld (Rothke); Kingdom of Saxony—Dresden, rare, Leipzig, very rare, Kottmar (Plauen); Province of Saxony—Erfurt, singly (Keferstein), Dölau and Dessau heaths, singly (Amelang), scarce in the forests of Steig and Willroda (Gillmer); Silesia—Bitke, rare, Heidewilen, not rare, Trebnitz, pretty frequent (Nohr), in the Oberland only at Herrnbut, very rare (Möschler), near Sagau, singly (Pfitzner), near Breslau, singly (Neustadt and Kornatzki); Thuringia, not everywhere—Arnstadt, Martinroda (Gillmer), Gotha, etc., not rare (Knapp), Gera, not rare (Lonitz), Mühlhausen, rare (Jordan); Waldeck—Rhoden, very abundant in some years, Wildungen, Korbach (Speyer); Württemberg, everywhere, but scarce (Keller)—Stuttgart, Tübingen, Reutlingen, etc., (Seyffer). GREECE: generally distributed (Fountain)—Attica, Parnassus, Naxos, but nowhere common (Staudinger), Nauplia, Athens, the Morea (Elwes), Corfu (de la Garde), Platrus (Bate). HOLLAND: common in all the Provinces (Snellen). ITALY: throughout; Abruzzi—Sulmona, Villalago, Palena, Roccaraso (Wheeler); Apulia—Brindisi (Simes); Lazio—Roman Campagna (Calberla), Subiaco (Wheeler); Liguria—Alpine parts (Curò); Lombardy—Bellagio (Forbes), Menaggio (ich); Piedmont—Baveno (Lemann), Stresa (Jones), between Bobbie and the Pellice Falls, Au Pra, Courmayeur (Tutt), Macugnaga (Bethune-Baker), Isella (Reverdin), Certosa di Pesio (Lowe), Susa (Rowland-Brown); Tuscany, common (Stefanelli)—Florence (Rowland-Brown), Fiesole (Wheeler), Boscungo (Norris); Umbria—Perugia, Assisi (Wheeler); Venezia—Malamocco (de la Garde). MALTA (Fletcher). NORWAY:—Christiania (Wallengren), Skogstad (Elwes), Tromsø, Salt-dalen (Sparre-Schneider), Akershus, Hedemarken, Buskerad, Braatsberg, Jarlsberg and Laurvik, Nedernaes, Lister and Mandal, South Bergenhus, Nordland, Dovrefeld (Schöyen). PORTUGAL:—San Fiel, very abundant (d'Azeredo), Setúbal (Vielledent). ROUMANIA:—Azuga, Dulcești, Comanesti, Tschachleu, Tultscha (Fleck). RUSSIA: Archangel—Karelia, throughout (Tengström); Baltic Provinces—Wolmar (Klingenberg), near Pichtendahl, one only (Nolcken), Lechts, Frauenberg (Huene); Bessarabia (Kroulikowsky); Central Caucasus (Schaposchnikoff); Crimea—South coast (Melioransky), above Yalta (Young); Jaroslav (Kroulikowsky); Kasan (Eversmann); Moscow—Moskaisk (Assmuss); Orenburg (Eversmann); Pskov (Kusnerzoff); St. Petersburg (Sievers); Samara—Busuluk, Sergiewsk (Eversmann); Tambov, fairly common (Assmuss); Transcaucasia—Tiflis, Borjom, Manglis, Derbent, Ordoubad, Daratchitchag (Romanoff); Viatka (Kroulikowsky); Vilna (Dampf). SARDINIA: Alghero (Mathew) Aranci Bay (Fletcher). SICILY, common (Fountain)—Catania, Syracuse, Etna (Zeller), Messina (de la Garde), Madonie, Ficuzza (Calberla), Castelbuono (Gianelli), Caronia (Ragusa), Taormina, Favorita (Struvé), Palermo (Minà-Palumbo). SPAIN: Andalusia—Sierra Nevada (Rambur), Granada (Nicholl), Malaga (Jones), Gibraltar (Walker) Algeciras (Sheldon); Aragon—Albarracin (Chapman), Teruel, Gea, Valdepesebres, Rodenas, Bronchales, Orihuela, Motos, Huelamo (Zapater); Asturias—Picos de Europa (Nicholl); Catalonia—Barcelona, Montserrat (Standen), Tibidado, Calella (Cuni-y-Martorell); Castile—La Granja, Canales della Sierra (Chapman); Leon—Bejar, Puerto de Pajares (Chapman). SWEDEN: Skane, Smaland, East Gothland, Stockholm (Wallengren), Tornea Quickjock (Lampa). SWITZERLAND: throughout, plains and mountains, to 7,500ft., or higher (Wheeler)—Bâle—near Bâle (Tutt); Berne—between Frutigen and Kandersteg (Jordan), Wengen (Moss), Macolin, Grindelwald (Lowe), Mürren (Speyer); Geneva—Versoix, Bois Taille, Bois des Frères, Vallon d'Allondin (Reverdin); Grisons, everywhere from the Coire Rheimthal, through the mountain valleys to the Piz Umbrail (Killias)—Le Prese (White), St. Moritz (Turner), Albula Pass (Killias), Palpuogna (Wheeler), Thusis, Rosegthal, Sertigthal, Dischmathal, Landwasserthal, Fluella Pass, Ofen Pass, Münsterthal, Muranzathal (Tutt); Ticino—Campolungo Pass (Muschamp), Bignasco, Fusio (Reverdin), Locarno (Chapman), Rezzino (Lowe), Faido (Wheeler), Piotta, Piottino, Biugnasco (Tutt); Unterwalden—Heggiswyl (Keynes), Engelberg (Rowland-Brown); Uri—Oberalp (Turner), Wassen (Keynes), Göschenen, Andermatt (Tutt), Hospenthal (Rowland-Brown); Valais—Martigny, Laquinthal, Ganterthal (Rehfous), Steinenthal, Col Ferret, Dents du Midi (Muschamp), Alpien, Almogelalp, Randa, Chandolin, Arolla (Reverdin), Eggishorn, Leuk to Leukerbad (Pearson), Saas Valley (Standen), Riffelberg (Jordan), Bérisal (Wheeler), Zmutthal (Jones), the Riffel (Turner), Trient, Zinal, Zermatt







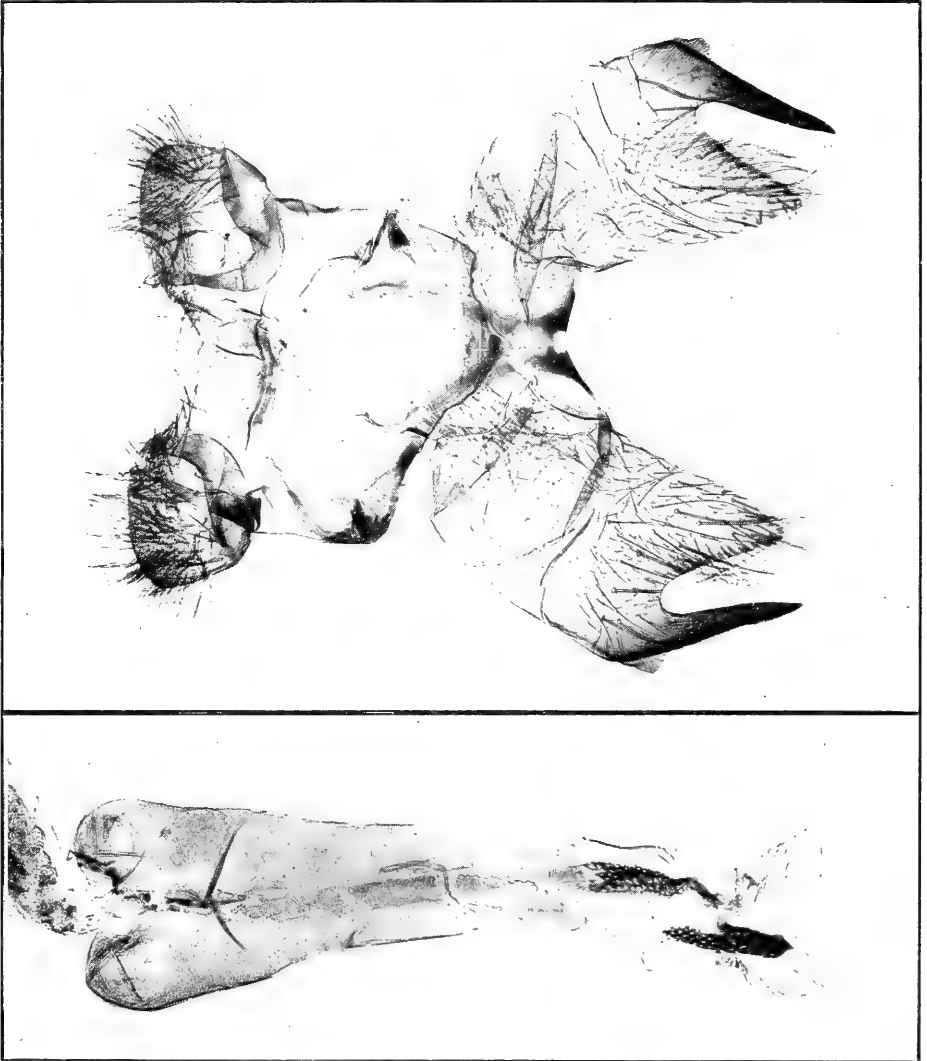
*Photo, F. N. Clark.*

APPENDAGES ON *L. ARION* 1, & 3,  $\times 35$ . 2,  $\times 40$ .

*A Natural History of the British Butterflies, etc., 1914.*

(To face p. 299).





*Photo, F. N. Clark.*

♂ APPENDAGES OF *L. ARIONIDES*,  $\times 25$  AND  $\times 40$ .



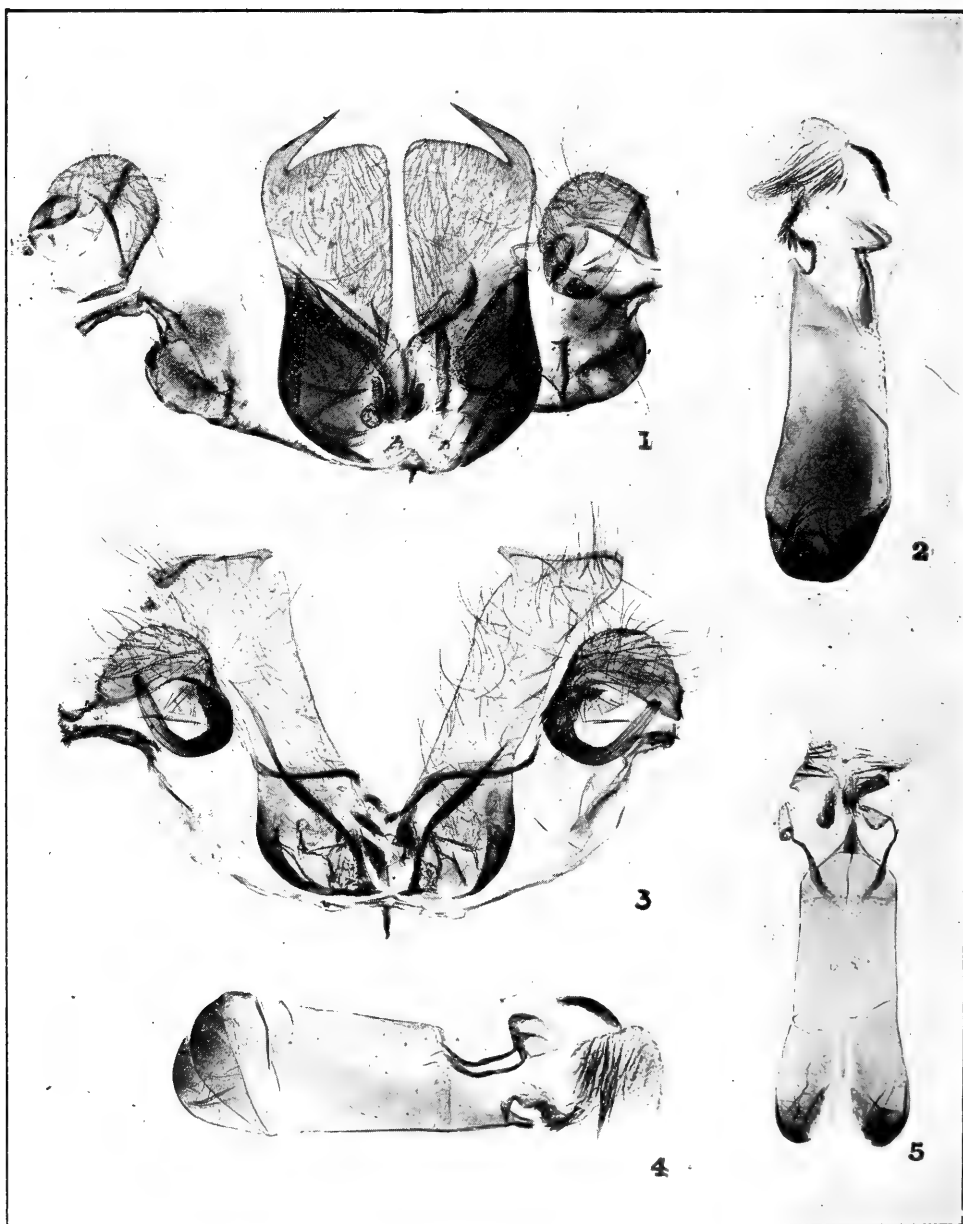


Photo. F. N. Clark.

♂ APPENDAGES OF 1. 2 *G. CYLLARUS*, AND 3, 4, 5. *L. MELANOPS*.  
1, 3,  $\times 25$ . 2, 4, 5,  $\times 40$ .

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(Page), Gondo (Rowland-Brown), Vernayaz, Sion (Alderson), Simplon Pass, Evolena, between Vex and Useigne, Ferpècle (Tutt), Val d'Hérens (Tasker), Follaterre, Fully, Susillon, Sierre, St. Nicholas, Visp, Brig. Naters, Grand St. Bernard (Favre); Vaud—Vallée de Joux, Vallorbe, Mont d'Or, Mont Tendre (Gibbs), Gimel (Muschamp), St. Cergues (Reverdin), Bex (Murray), Aigle, Sépey, Rossinières (Tasker), Caux (Alderson), Veytaux, Éclépens (Wheeler). TURKEY: Gallipoli, Salonika, Port Baklar, abundant (Mathew), Isle des Princes, Constantinople (Muschamp), Kiathané, Therapia, Küçük-Tchekmedjé near San Stefano (Graves).

ADDENDUM. *Ab. graafii*; also in France, Chaloché (Bonneville), la Ballue, with some of the lunules white on one side only (Delahaye), Dompierre-sur-Mer, a mixture of *abs. pallidior* and *graafii* (Lucas).

#### Tribe: LYCAENIDI.

Dr. Chapman supplies the following notes on this tribe:—

The *Lycaenidi* may be defined as a group of Blues having the clasp of the male appendages of somewhat rectangular outline, with the spinous angle (harpe) produced as a long narrow process, bent down so as to be nearly parallel with the distal margin; the dorsal armature has strong curved hooks, and is reduced to a narrow neck in the medio-dorsal line. The aedeagus is short, expanded basally, often into a double bulbar outline, and with cornuti on the eversible membrane; these have considerably close resemblance to each other within the group. In one or two species the spine of the clasp is shorter than usual, and is usually (*Glaucopsyche*) flatter and more directly transverse than in *arion*. It will be noticed that these characters approach fairly closely to those of the *nedda* group of *Lycaenopsis*, with the notable difference that *Lycaenopsis* has no hooks on the dorsal armature, and that they are very strong in *Lycaena*. Nevertheless there is probably here a real relationship, the genus *Notarthrinus* of *Lycaenopsids* do, in fact, possess these dorsal hooks.

I am not prepared to define genera in the *Lycaenidi* by the genitalia, though it may be noted that in *arion* the spine of the clasp is studded with minute teeth, and there is even a spinous annex at its base, and that in *cyllarus*, *lygdamus*, etc. (*Glaucopsyche*), the spine lies down more flatly and is perfectly smooth.

Apart from the genitalia I find it more than difficult to suggest family characters for the *Lycaenidi*. Structural characters in the palæarctic Blues are very uniform, and whether from the presence of identical circumstances or from actual mimicry, the facies of pairs or more of species of very distinct groups is remarkably similar. For example *semiargus* is a Plebeiid, but it might on its facies be ranged as an Everid with *minima*, or as a *Lycaenid* with *cyllarus*. As characters of the *Lycaenidi*, but not altogether distinctive, we have upperside markings (suggesting *Chrysophanids*) in both sexes, or in ♀♀ only. This would characterise *Lycaena* only, and would tend to place *melanops* in *Lycaena*. *Lycaena* would differ from *Glaucopsyche* in still retaining underside traces of marginal eyespots, this would tend to exclude *arcas*, and would include *melanops*. *Glaucopsyche* (*lygdamus*, *cyllarus*) would be without any trace of these eyespots (Chapman).

Chapman divides the tribe into three genera, viz.:—

- (1) *Lycaena*, Fabr., containing *arion*, L., *euphemus*, Hb., *arcas*, Rott., *alcon*, Fabr., *arionides*, Stgr., *atroguttata*, Obth.,\* and *melanops*, Bsdv.

\* *Atroguttata* appears to me much better placed in the separate genus *Phenagaris*, Doh.; to this Dr. Chapman sees no objection, and adds that Tutt would probably have further subdivided the genus.—(G.W.)

- (2) *Glaucopsyche*, Scudd., containing *lygdamus*, Dbldy., *lycormas*, Butl., *cyllarus*, Rott., *astraea*, Fr., *antiacis*, Bsdv., *behrii*, Edw., and *lederi*, Bang-Haas, possibly also *coelestina*, Evers., *diana*, and *laetifica*, Pung.

- (3) *Phaedrotes*, Scudd., containing *sagittigera*, Feld.

It will be observed that *melanops* is, according to this arrangement, separated from *cyllarus*, and *iolas* removed from the tribe altogether.

In plates xxix., xxx., and xxxi., are given figures of the appendages of several species of *Lycaenidi*. In the first are those of *L. arion*, which shows the characteristic form of the clasp, the sharp pointed spine with a few teeth in its margin, and a small toothed process at its base. This process also occurs in *arionides*, but I have not seen it in other species. The ædæagus presents the bilobed base, which characterises the group, and is also found in some *Lycænopsids* and in *Scolitantides*, showing some alliance between these groups, and in the case of *Scolitantides*, with other features, bringing it so close, that it is rather a matter of personal opinion as to how much difference shall separate sub-tribes in this section, than as to fact, whether *Scolitantides* shall or shall not be included in *Lycaenidi*.

A similar attitude may be taken as to *arion* and *arionides*, the latter figured in pl. xxx. I incline to call them good species rather than extreme geographical varieties.

In pl. xxxi. the appendages of *Glaucopsyche* are figured. This differs from *Lycaena* in the spine being quite smooth, *i.e.*, free from teeth. The appendages of *melanops* may justify its being placed in a genus distinct from *Lycaena*, but a doubt would then arise whether *alcon* should be left in *Lycaena* or placed with *melanops*, a doubt perhaps only to be solved by placing *alcon* in another new genus. I prefer leaving *melanops* in *Lycaena*. The ædæagus differs a little in specimens from Spain and from South France; the ordinary imaginal characters also differ a little and show the two forms to be distinct races (Chapman).

#### Genus: *LYCÆNA*, Fabricius.

SYNONYMY.—Genus: **Lycaena**, Fab., "Ill. Mag.," vi., p. 286 (1807); Oken, "Lehrb.," ii., p. 718 (1815); Ochs., "Die Schmett.," iv., p. 24 (1816); Sam., "Ent. Comp.," p. 26 (1819); Koll., "Schmett. (Estr.," p. 8 (1832); Treits., "Die Schmett.," x., Suppl., pt. 1, p. 58 (1834); Thon., "Ersch und Gräber's Allg. Ency.," 3rd ser., xi., p. 139 (1838); Bsdv., "Gen. et Ind. Meth.," p. 13 (1840); Neust. and Korn., "Schmett. Schles.," i., p. 41, pl. xix., figs. 60 a-c (1842); H.-Sch., "Sys. Bearb.," i., p. 118 (1843); Suppl., pl. cviii., figs. 519, 20 (1851); vi., p. 25 (1852); Evers., "Fn. Volg.-Ural.," p. 42 (1844); de Sél.-Lngch., "Enum. Lép. Belg.," p. 4 (1845); Dup., "Cat. Méth.," p. 31 (1845); Nick., "Lep. Böhm.," p. 17 (1850); Hdneh., "Lep. Eur. Cat. Meth.," p. 13 (1851); Gerh., "Mon.," p. 19, pl. xxxiii., figs. 3 a-c, pl. xxxviii., figs. 1a-3b (1852); M.-Dür., "Schmett. Schw.," p. 98 (1852); Westw. and Hew., "Gen. Diurn. Lep.," ii., p. 491 (1852); Led., "Verh. zool.-bot. Gesells.," ii., p. 21 (1852); Wllgrn., "Skand. Dagf.," p. 230 (1853); Reutti, "Lep. Fn. Bad.," p. 39 (1853); Koch, "Geogr. Verb.," p. 50 (1854); "Schmett. Sudw. Deutsch.," p. 28 (1856); Assm., "Stett. Ent. Zeits.," xviii., p. 381 (1857); Speyer, "Geogr. Verb.," i., p. 244 (1858); Dbldy., "Syn. List.," 2nd ed., p. 2 (1859); Now., "Lep. Hal. Or.," p. 9 (1860); Zebr., "Lep. Krak.," p. 154 (1860); Staud., "Cat.," 1st ed., p. 6 (1861); Led., "Wien. Ent. Mon.," vii., p. 18 (1863); Rössl., "Schmett. Nass.," p. 16 (1866); Snell., "De Vlind.," i., p. 56 (1867); Berce, "Fn. Fr.," i., p. 150, pl. vii., fig. 6 (1867); Nolck., "Lep. Fn. Estl.," i., p. 58 (1865); Stange, "Schmett. Halle.," p. 4 (1869); Tengstr., "Cat. Lep. Fn. Fenn.," p. 2 (1869); Butl., "Cat. Diurn. Lep.," p. 168 (1869); Peyerim., "Lép. Als.," 3rd ed., p. 9 (1871); Staud., "Cat.," 2nd ed., p. 14 (1871); Newm., "Brit. Butts.," p. 136,



fig. 48 (1872); Bang-Haas, "Nat. Tids.," 3rd ser., ix., p. 395 (1874); Curò, "Bull. Soc. Ent. It.," vi., p. 114 (1874); Mill., "Cat. Lép. Alp.-Mar.," p. 105 (1875); Sand, "Lép. Ber. Auv.," p. 7 (1879); Frey, "Lép. Schweiz.," p. 22 (1880); Rössl., "Lép. Wiesb.," p. 31 (1881); Jourdh., "Lép. Aube.," p. 19 (1883); Berce, "Lép. Fr.," p. 19, pl. iii., figs. 25, 26 (1884); Lang, "Butts. Eur.," p. 133, pl. xxxii., fig. 5 (1884); Rom., "Mem. Lep.," i., p. 54 (1884); Lampa, "Ent. Tids.," vi., p. 15 (1885); Kane, "Eur. Butts.," p. 51 (1885); Kill., "Ins. Graub.," p. 22 (1886); Auriv., "Nord. Fjär.," p. 15, pl. vi., fig. 1 (1888); Kroul., "Soc. Ent.," vii., p. 1 (1892); Brom., "Butts. Riv.," p. 45 (1892); Rühl, "Pal. Gr.-Schmett.," pp. 307 (1893), 769 (1895); Meyr., "Hndbk.," p. 349 (1895); Tutt, "Brit. Butts.," p. 157, pl. ii., fig. 2 (1896); "Ent. Rec.," vii. pp. 220, 300 (1896); viii., pp. 120-125 (1896); Obth., "Études," xx., p. 15, pl. iii., figs. 19, 20 (1896); Grete, "Schmett. Hild.," p. 42 (1897); Reut., "Ent. Rec.," x., p. 97 (1898); Favre, "Macr.-Lép. Val.," p. 24 (1899); Elwes, "Trans. Ent. Soc. Lond.," p. 329 (1899); Stef., "Bull. Soc. Ent. It.," xxxii., p. 342 (1900); Staud., "Cat.," 3rd ed., p. 90 (1901); Fleck, "Macr.-Lép. Rumän.," p. 24 (1901); Rond., "Cat. Lép. Pyr.," p. 45 (1901); Lamb., "Pap. Belg.," p. 253 (1902); Spul., "Schmett. Eur.," p. 69, pl. xvii., figs. 15 a, b (1902); Wheel., "Butts. Switz.," etc., p. 20 (1903); Courv., "Mitt. Schw. Ent. Gesells.," xi., pt. i., pp. 22, 24 (1903); Tutt, "Ent. Rec.," xviii., pp. 130, 132 (1906); le Chamb., "Ent.," xli., p. 201 (1908); Rebel, "Berges Schmett.," 9th ed., p. 75, pl. xiv., fig. 22 (1909); Obth., "Lép. Comp.," iv., p. 321 (1910); Seitz, "Gr.-Schmett.," p. 321, pl. lxxxiii., c (1910); Courv., "Ent. Zeits.," xxiv., pp. 199, 200 (1910).

**Papilio- [Plebeius]**, Linn., "Sys. Nat.," xth ed., p. 483 (1758); Müll., "Faun. Frid.," p. 36 (1764). **Papilio**, Linn., "Faun. Suec.," 2nd ed., p. 283 (1761); Hüfn., "Berl. Mag.," ii., p. 70 (1766); Schiff., "Schmett. Wien.," 1st ed., p. 182 (1775); Fuess., "Verz.," p. 31 (1775); Rott., "Naturf.," vi., p. 7 (1775); Müll., "Zool. Dan. Prod.," p. 115 (1776); Schneid., "Sys. Besch.," p. 261 (1787); Bork., "Sys. Besch.," i., pp. 167, 280 (1788); ii., p. 232 (1789); Lang, "Verz.," p. 55 (1789); Bork., "Rhein. Mag.," i., 281 (1793); Don., "Brit. Ins.," vi., p. 11, pl. clxxxv., figs. 1-2 (1795); Lewin, "Ins. Gt. Brit.," i., p. 78, pl. xxxvii., figs. 1-2 (1795); Hb., "Eur. Schmett.," pl. liv., figs. 254-6 (1796); text, p. 44 (1805); Ill., "Schmett. Wien.," 2nd ed., ii., p. 263 (1801); Hffmngg., "Ill. Mag.," iii., p. 186 (1803); Herbst, "Nat. Sys. Ins.," xi., p. 163, pl. cccviii., figs. 7-8 (1804); Ochs., "Schmett. Sachs.," p. 297 (1805); "Die Schmett.," i., pt. 2, p. 4 (1808); Jerm., "Butt. Coll. Vade-mec.," pp. 34, 57 (1824).

**[Papilio-] Argus**, Scop., "Ent. Carn.," p. 177 (1763). **[Papilio-Plebeius-] Rurialis**, Poda, "Mus. Graec.," p. 76 (1761); Linn., "Sys. Nat.," xiith ed., p. 789 (1767); Fab., "Sys. Ent.," p. 524 (1775); Esp., "Schmett. Eur.," i., pt. 1, p. 266, pl. xx., fig. 2 (1777); i., pt. 2, p. 53, pl. lix. (contd. ix.), fig. 2 (1780); Bergs., "Nom.," ii., pp. 33, 34, pl. xxiv., fig. 4; p. 71, pl. xliii., figs. 5, 6; iii., p. 6, pl. li., figs. 5, 6; p. 8, pl. lii., figs. 5, 6; p. 19, pl. lxi., figs. 7, 8 (1779); Göze, "Ent. Beitr.," iii., pt. 2, p. 17 (1780); Fab., "Spec. Ins.," ii., p. 122 (1781); "Mant. Ins.," p. 71 (1787); de Vill., "Car. Lin. Ent. Fn. Suec.," ii., p. 65 (1789); Haw., "Lep. Brit.," p. 43 (1803). **[Hesperia-] Rurialis**, Fab., "Ent. Syst.," iii., pt. 1, p. 293 (1793); Panz., "Sch. Icon. Ins.," p. 109, pl. xcvi., fig. 62 (1804).

**Cupido**, Schrank, "Fn. Boica," ii., pt. 1, p. 209 (1801); Kirby, "Syn. Cat.," p. 374 (1871). **Polyommatus**, Lat., "Hist. Nat. Crust.," xiv., p. 119 (1805); Godt., "Ency. Méth.," ix., p. 616 (1819); Stphs., "Illus. Haust.," i., p. 87 (1828); "Ins. Cat.," 1st ed., i., p. 23 (1829); Bsdv., "Eur. Lep. Ind. Meth.," p. 13 (1829); Meig., "Eur. Schmett.," ii., p. 2, pl. xliii., figs. 1 a, b (1830); Jerm., "Butt. Coll. Vade-mec.," 3rd ed., pp. 50, 112 (1836); Dunc., "Nat. Hist. Brit. Butts.," p. 233, pl. xxxiii., fig. 1 (1836); de Sél.-Lngch., "Cat. Lep. Belg.," p. 17 (1837); Curt., "Cat. Brit. Ins.," p. 174 (1837); Wood, "Ind. Ent.," p. 8, pl. iii., figs. 64, ♂ and ♀ (1839); Westw., "Syn. Gen.," p. 88 (1840); Humph. and Westw., "Brit. Butts.," p. 104, pl. xxxii., figs. 1-3 (1841); Stphs., "List," 1st ed., p. 2 (1850); Dbldy., "Syn. List," 1st ed., p. 1 (1850); Stn., "Man.," i., p. 59 (1857); Hein., "Schmett. Deutsch.," p. 75 (1879); Kirby, "Man.," p. 112 (1862); Parfitt, "Lep. Devon.," p. 20 (1878); Kirby, "Eur. Butts.," p. 45 (1879); Buckl., "Larvæ.," i., pp. 105, 188 (1885); Dale, "Hist. Brit. Butts.," p. 57 (1890); Barr., "Lep. Brit. Isl.," i., p. 96, pl. xiv., figs. 3-3c (1893).

**[Zephyrus-] Cyaniris**, Dalm., "Vetens. Ak. Handl.," p. 94 (1816). **Nomiades**, Hb., "Verz.," p. 67 (1818); Stphs., "Illus. Haust.," iv., app., p. 404 (1835); Scudd., "Hist. Sketch.," p. 228 (1875); Kirby, "Hndbk.," ii., p. 108, pl. xlvii., figs. 1, 2 (1896); Kusn., "Hor. Soc. Ent. Ross.," xxxvii., p. 29 (1904); South, "Brit. Butts.," p. 179, pl. cxvi.,

cxvii., 1-6 (1905). **Argus**, Dup., "Pap. Fr.," supp. i., p. 389 (1832); Cant., "Lép. Var.," p. 6 (1833). **Polyommatus-[Nomiades]**, Stphs., "List," 2nd ed., p. 17 (1856).

The genus *Lycaena* was first diagnosed by Fabricius (*Ill. Mag.*, vi., p. 285) in 1807, and was used in a most comprehensive sense, including "blues," "coppers" and some "hairstreaks." Its description reads:

*Lycaena*.—Palpi two-jointed; the first joint fringed externally, the second cylindrical, naked; antennæ knobbed. Legs almost alike, fully developed\*.

(1) Wings two-tailed—*Hesperia mars*, *echion*.

(2) Wings tailed—*Hesperia amyntas*, *rubi*.

(3) Wings untailed—*Hesperia meleager*, *arion*, *corydon*, *adonis*, *ledi*, *virgaureae*, *phlaeas*.

In 1815, Leach retained *Lycaena* for the "coppers" and "blues," with the addition of *C. rubi*, whilst Oken also in the same year restricted the name entirely to the blues (see preceding vol. p. 306) and was followed by Ochsenheimer, so that Curtis' action in 1824 (*Illus. Brit. Ent.*, fo. 12) naming *phlaeas* the type of *Lycaena* was altogether *ultra vires*.

In 1838, Thon, in his article *Lycaena*, in Ersch and Gräber's "Allgemeine Encyclopädie der Wissenschaften und Künste," 3rd ed., vol. xi., p. 139, cites only *arion* as an example of the genus, and so restricted it to the special little group of which *arion* is probably the best known species. Scudder, in 1875, overlooked this restriction, and notes (*Historical Sketch*, p. 209) *endymion* (*meleager*) as the type, a conclusion that fails because of Thon's previous restriction.

#### LYCAENA ARION, Linné.

SYNONYMY.—Species; **Arion**, Linn., "Syst. Nat.," xth ed., p. 483 (1758); "Faun. Suec.," 2nd ed., p. 283 (1761); Poda, "Mus. Graec.," p. 76 (1761); Scop., "Ent. Carn.," p. 177 (1763); Müll., "Faun. Frid.," p. 36 (1764); Hüfn., "Berl. Mag.," ii., p. 70 (1766); Linn., "Sys. Nat.," xiith ed., p. 789 (1767); Fab., "Syst. Ent.," i., p. 524 (1775); Schiff., "Schmettt. Wien.," 1st ed., p. 182 (1775); Fuess., "Verz.," p. 31 (1775); Rott., "Naturf.," vi., p. 7 (1775); Müll., "Zool. Dan. Prod.," p. 115 (1776); Esp., "Schmettt. Eur.," pl. xx., fig. 2 (1777); pl. lix. (cont. ix.), fig. 2, ♀ (1780); Bergs., "Nom.," ii., pp. 33-34, pl. xxiv., fig. 4; p. 71, pl. xliii., fig. 4; iii., p. 6, pl. li., figs. 5-6 (1779); Göze, "Ent. Beit.," iii., pt. 2, p. 17 (1780); Fab., "Spec. Ins.," pt. 2, p. 122 (1781); Schneid., "Sys. Bech.," p. 261 (1787); Fab., "Mant. Ins.," p. 71 (1787); Bkh., "Sys. Besch.," i., pp. 167, 280 (1788); ii., p. 232 (1789); De Vill., "Car. Linn. Ent. Fn. Suec.," ii., p. 65 (1789); Lang, "Verz.," p. 55 (1789); Fab., "Ent. Syst.," iii., pt. 1, p. 293 (1793); Bkh., "Rhein Mag.," i., p. 281 (1793); Lewin, "Ins. Gt. Brit.," i., p. 78, pl. xxxvii., figs. 1-3 (1795); Hb., "Eur. Schmettt.," pl. liv., figs. 254-6 (1796); text, p. 44 (1806); Don., "Brit. Ins.," vi., p. 11, pl. clxxxiv., figs. 1-2 (1797); Ill., "Schmettt. Wien.," 2nd ed., ii., p. 263 (1801); Schrank, "Faun. Boica.," ii., pt. 1, p. 209 (1801); Haw., "Lep. Brit.," p. 43 (1803); Hfmsgg., "Ill. Mag.," iii., p. 185 (1803); Herbst, "Nat. Syst. Ins.," xi., p. 163, pl. cccviii., figs. 7, 8 (1804); Panz., "Sch. Icon. Ins.," p. 109, pl. xeviii., fig. 6, ♀ (1804); Latr., "Hist. Nat. Crust.," xiv., p. 119 (1805); Fab., "Ill. Mag.," vi., p. 286 (1807); Ochs., "Die Schmettt.," i., pt. 2, p. 4 (1808); Godt., "Pap. Fr.," i., p. 219, pl. xi., fig. 2, pl. xi. quart., fig. 1 (1821). **Teleius**, Bergs., "Nom.," ii., p. 73, pl. xliii., figs. 5, 6 (1779). **Telegone**, Bergs., "Nom.," iii., p. 8, pl. lii., figs. 5-6 (1779). **Telegonos**, Bergs., "Nom.," iii., p. 19, pl. lxi., figs. 7, 8 (1779). **Alcon**, Stphs., "Illus. Haust.," i., p. 88 (1828); iv. app., p. 404 (1835). **Cyane-cula**, Evers., "Bull. Soc. Nat. Mosc.," ii., p. 207 (1848); Dbldy. and Westw., "Gen. Diurn. Lep.," ii., p. 491 (1852); Gerh., "Mon.," p. 19, pl. xxxvi., figs.

\* The Lycaenids were long described in this way, but incorrectly, for, though the front legs of the ♀s are adapted for walking, those of the ♂s are not. This seems to have been first observed by Speyer in 1843.

2a, b (1852); H.-Sch., "Sys. Bearb.," vi., p. 25, pl. cxiii., figs. 593, 4 (1856); Graes., "Berl. Ent. Zeits.," p. 81 (1888). *Arthurus*, Melv., "Ent. Mo. Mag.," ix., p. 263 (1872).

[N.B.—All other references mentioned under the generic synonymy (*antea* pp. 300-302) are referable to *arion*.]

ORIGINAL DESCRIPTION.—P.P. alis ecaudatis, supra fuscis disco caeruleo maculis atris: subtus canis punctis ocellaribus. Habitat in Europa.

Roes. ins. 3 suppl. t. 45, f. 3, 4.

Statura sequentis [*argus*] sed duplo major. Alæ posticæ subtus ocellis 10, præter puncta marginalia (Linneus).

The above description would seem to make the dark alpine form the type, were it not for the explicit reference to Rösels figure, in which the bright blue extends to the base of the wings.

In the *Fauna Suecica*, 2nd ed., Linneus says that it is very scarce in Sweden, and adds the following description:—

Facies *P. argi*, sed duplo major, alæ supra fuscæ disco caeruleo. Primores supra in disco punctis nigris, septem, confertis. Subtus omnes cinerascens, basi virescentes et postice duplici ordine punctorum nigrorum, insuper puncta nigra ocellaria, iride alba, 7 in primoribus, 10 in secundariis, præter lunulam nigram.

From the number of spots mentioned it may be inferred that Linneus's typical form has, as is most often the case, one basal spot on the forewing and three on the hindwing on the underside.

IMAGO.—37mm.-46mm. Deep rich blue with a broad brownish-black outer band, an arcuate series of black longitudinal wedge shaped spots and black discal spot on forewings; a more or less obsolescent central row of black spots and traces of a marginal row of black dots on the hindwings. Underside dark grey, with more or less of a brownish tint, a double row of marginal spots to all the wings; forewings with a sickle-shaped discal row of black spots and black discoidal spot, usually one basal spot only, the upper one being generally absent; hindwing metallic blue at base, a median row of black spots, a black discoidal and usually three basal spots, the third from the costa being absent. All the median and basal spots on both wings surrounded with whitish.

SEXUAL DIMORPHISM.—The ♂ is usually lighter, slightly smaller, and less heavily spotted than the ♀ from the same locality, the border also being proportionately narrower, but numberless exceptions occur in which one or more of these rules does not hold good, British examples of the ♀, for instance, being often quite as light in ground colour as the ♂s. On the average, however, the difference mentioned above will be found to prevail, though the variation in size is so great that in many localities, especially in the mountains, the smallest ♀s are very much less in size than many of the ♂s.

Aurivillius notes that the androconia are somewhat circular and ornamented with 12 to 13 rows of spots, yet he notes them as 0.05mm. in length (without the stem) and 0.27mm. in width (*Bidrag*, etc., v., pp. 24, 26). Pierce notes (*in litt.*) that they (the androconia) are .0015in. in length and .001in. in width, slightly curved at the apex and with 9 or 10 rows of 10 spots, the latter broken and often coalescing in twos and threes. The other scales in the ♂ are (1) The transparent scales, .004in. × .002in., are bright bronze-yellow,

generally 5 lobed, the largest being in the centre of the apex. (2) The darker scales of similar size and shape. (3) The underside scales 4-pointed. The ♀ has the transparent scales predominating, very similar to the ♂; the underside scales 4-pointed.

GYNANDROMORPHS.—The following are the gynandromorphs which have come under our notice.

α. Right side ♂, left ♀; taken near Amboise. (Rühl, *Pal. Gross-Schmett.*, p. 307, 1893.)

β. Right side ♀, left ♂; rather a small specimen, taken by Muschamp in 1909. Right side: forewing 20mm., hindwing 17½mm., large spots on forewing, upperside, and black spots on marginal border. Left side: forewing 16mm., hindwing 13½mm.; spots on upperside forewing lost in the dark ground colour. Abdomen has ♂ genital organs but is of ♀ shape, and has fewer hairs on the right side. Underside of wings not so markedly different, the female side however has one more spot on the fore- and two more on the hindwing. Antennæ normal. Wing area of ♀ about double that of ♂ side (Muschamp).

γ. Right wings ♂, left ♀, taken in Cornwall, July 1901, by Bethune-Baker, (see *Ent.*, xxxiv., p. 362). The transverse curved row of spots of the left primary consists of a small spot below vein 7, second spot below vein 6 of fair size, third spot rather larger, fourth larger again, fifth spot, shifted right inwards, nearly as large as the fourth, sixth spot very small and as usual shifted outwards, the difference in the width of the dark borders of the primaries is very slight. In the secondary there are two obscure small spots, in the internervular spaces between veins 3 and 4 and 4 and 5; the dark border is decidedly wider than in the ♂ right wing. In the right, i.e., ♂, primary, the first spot is absent, two, three and four are decidedly smaller than in the left wing, whilst five is an exceedingly small round spot, and the sixth is absent. The spot closing the cell is about the same in each wing. The secondary is spotless and has a narrower dark border than the left, or ♀, secondary has. The undersurface is very fully spotted but there is practically no difference in the pattern or size of the spots. Antennæ, the left one is finer and slightly longer than the right, the difference in the thickness of the two is visible with the naked eye. Undersurface, the difference in the size of the spots and the pattern is but slight but it is discernable. The number of spots below is the same in each wing. Both the forelegs are ♀. The left primary measures barely 20½mm. the right 21mm., in each case the measurement is from the juncture with the thorax but not including the thorax. The secondaries measure 16 and 17mm. respectively for the left and right wings. The difference in the size of the two sides is more apparent to the eye than the measurements indicate, and it would appear that the ♀ side would have belonged to a smaller insect than the ♂, instead of *vice versa* as so often happens (Bethune-Baker).

δ. Right side ♀, left side ♂; also taken by Bethune-Baker, at Engelberg, on July 6th, 1886. This is a large dull blue specimen with all the spots much reduced. There are three smallish spots on the male side, with merely a black dot between veins 2 and 3, whilst on the female side there are three rather larger spots followed by a small black spot between veins 2 and 3; the cell spot is the same on both sides. The secondaries are both spotless. The wings are slightly smaller on the male side than on the female. The ♂ antenna is certainly finer than the ♀ antenna. The left fore tarsus is aborted and therefore ♂, whilst the ♀ side has the tarsus developed as it should be (Bethune-Baker).

VARIATION.—The variation in this species is very considerable, although two of the most fruitful sources of difference are absent, *viz.*, marked colour-dimorphism in the sexes and orange spots on the underside. So far as the upperside is concerned, the principal forms of variation were noted by Borkhausen (*Syst. Besch.*, i., p. 168) so long ago as 1788, and though many forms have since been named they might almost all be grouped under his headings. He notes them as follows:—

- (a) The number of the black spots on the forewings is not always the same. One finds examples with three, four, six and even with eight and nine spots. Also they are not always of the same size. Sometimes they appear as strong dashes, sometimes as commas.

- (b) The hindwings are occasionally quite unspotted; sometimes they have a band of black dots or sometimes of black spots; sometimes, instead of the band, only isolated spots or dots are present.
- (c) The margin of the hindwings is sometimes very broad, without darker spots, sometimes very narrow, and then black spots appear with a pale cloudy ring round them.
- (d) The ground colour is sometimes a paler and sometimes a more intense blue. Sometimes it is so dark that it comes near to black.
- (e) In size this butterfly also varies. One finds specimens which hardly reach the size of *argus* (Borkhausen).

With regard to the underside, however, where the variation is really as marked as on the upper surface, he observes that it is alike in all cases, relying on this to show the specific identity of the various forms he cites.

Frühstorfer has divided *arion* into a number of "sub-species," founded generally on a few insects taken from time to time in different localities, which he dignifies with the name of local races. Practically all other entomologists agree in the observation that both in size and markings this species is remarkably variable throughout most of its range, and that it is very rarely that any form of variation is at all confined to any special locality, though certain peculiarities are often predominant. For instance the mountain specimens are generally more or less suffused with black, but Wheeler observes (*Ent. Record*, xiii., p. 119) that at Mürren, which is at the same altitude as Zermatt, "*arion* resembles the form of the lowlands, being very bright and clearly marked, with no inclination towards var. *obscura*." On the other hand the darkest form described, ab. *aldrovandus*, de Sél.-Lingch., which has the whole upper surface suffused with black, with only a slight dusting of blue basally, was named from a specimen taken at the foot of Mt. Vesuvius, while Wheeler (*in litt.*) notes another in his collection exactly corresponding with this, taken at Iselle, near the bottom of the southern slope of the Simplon. No one who has collected butterflies in the Alps can fail to be aware how frequently ab. *obscura*, Christ, is to be found among large, broad-bordered, but basally bright blue, specimens, to which this name should not, strictly speaking, be applied; and it is impossible to deprecate too strongly the misuse of terms by which alone such a form can be called a sub-species; and still less can the term be legitimately employed to designate forms of which half-a-dozen or less have been taken in the same neighbourhood. We have frequently objected altogether to the use of the term, but, if it be employed at all, it should at least be confined to forms which so greatly predominate in a given locality, that others, which may occur among them, can only be regarded as casual aberrations, obviously in process of being weeded out.

Oberthür, (*Lép. Comp.*, iv., p. 326) has demonstrated precisely the condition of local races in this species. He says:—"Examination of *arion* from these different localities\* shows that there is in each a race whose facies or general appearance is distinctive, but with an admixture of examples recalling those which constitute the majority in other localities. Thus, wherever *arion* flies there are large and small speci-

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\* He has enumerated England, Brittany, the Pyrénées-orientales, the Italian Riviera, the Alpes-maritimes, Digne, Zermatt, the Tyrol, Fusio, Stresa, Greece, the Bernese Oberland, the Bernese Jura, Savoie, Corsica, Lozère, Gironde, Charente, the Hautes-Alpes, Doubs, Lake Baikal and East Turkestan.

mens, examples with the spots much reduced or developed on the upperside and with the blue tint brighter or greyer; below, the normal spotting is more or less accentuated, with the brown tint of the ground colour ochreous or greyish, and the greenish-blue powdering more or less extended from the base of the hindwings towards the middle. A local race must therefore be judged from a series of individuals. Thus, a series of *ligurica* compared with another series of *arion* from the Pyrénées-orientales, will appear, when looked at in a general and comprehensive way, very distinct. Notwithstanding, amongst the *arion* from Vernet, one will find examples of a lighter blue, furnished with very large, very black spots, with an interneural row of whitish ocelli pupilled with black along the border of the hindwings. These Pyrenean *arion* would not appear out of place in a row of *arion* from Mentone or Mt. Pacanaglia. However, the Pyrenean race is, speaking generally, much darker."

The variation in size in this species is very great, amounting to as much as 20mm. The smallest ♂ in the Brit. Mus. coll., an English one, has an expanse of only 30mm., whilst the largest ♀, from the Valais, measures 50mm. Amongst the British examples the smallest ♀ measures 31mm. as against 42mm. which is the expanse of the largest, while the smallest ♂, 30mm., as just mentioned, contrasts almost as strongly with the largest British ♂ with an expanse of 40mm. From this it will appear that the British race is somewhat below the average in size, though the small specimens are comparatively uncommon, the average size of the ♂s from the general range of the species being from 37mm.-44mm., and of the ♀s from 40mm.-46mm. The smallest specimens are from the Cotswolds, and the following quotation from the *Trans. Ent. Soc. Lond.* for 1877, p. xxiv., accords with this:—"Mr. H. Goss exhibited a series of specimens of *Lycaena arion* taken in the Cotswolds in June 1877. One-third of the specimens exhibited were far below the average size, the remainder being of the normal size. Both forms were taken flying together at the same time of the year in the same locality. Mr. Goss stated that according to his experience these dwarf specimens did not occur in the same proportion in other parts of the country where the species was taken. The specimens he had obtained in Devonshire and Northamptonshire were, as a rule, of the average size."

The range of spotting on the forewings on the upperside is greater than was known to Borkhausen, though he is, of course, taking the discoidal spot into his calculation, for this is sometimes the only marking to be seen on this wing, and even this is occasionally wanting. On the other hand the presence of the whole series of eight submedian spots is exceedingly rare, but one, or even two, basal spots on the upperside of the forewing are not very scarce, especially in English examples, while in some alpine and Oriental specimens there are as many as three. In the submedian series, 3 or 4 in the ♂, 4-6 in the ♀ are the number of spots most commonly seen. The hindwing is frequently unspotted, not even the discoidal spot always occurring, but this is always traceable whenever two or more of the median series are present. In size also the spots differ greatly, being sometimes scarcely visible dots, and sometimes large elongated ovals or pear-shaped dashes, so broad as to produce the appearance of a macular band, always, however, divided by the nervures. The antemarginal series

can nearly always be traced unless entirely merged in the dark border, sometimes only the inner edges projecting beyond the border in the forewing, sometimes the whole series standing out distinctly, whilst on the hindwing the series, when the border is narrow, or almost obsolete, is sometimes edged, either internally, or all round, with an ill-defined ring of a cloudy whitish tint, which sometimes appears internally on the forewing also. The dark border, again, may be sharply defined or melt gradually into the ground-colour, and in width varies from practical absence on the hindwing, and extreme obsolescence on the forewing, to suffusion of practically the whole area of the wings; in this latter case the spots frequently show through the suffusion as a darker black, much as do the normal spots on the black varieties of the leopard or jaguar. Greatly as the ground-colour seems to differ on the upperside in the intensity of its blue, there are really few forms in which, when seen with a lens, there is any very appreciable difference in the tint of the blue scales themselves, the variation being brought about by the greater or less admixture of black scales with the blue ones, amounting in extreme cases to an almost complete suppression of the latter, which remain only as a scattered powdering towards the base, though generally in considerable numbers over the basal half, and always concentrated at the base itself. The only notable exception is a form from the Amoor district in which the ground-colour is a pale blue-grey, the scales in this case being of quite a different colour.\* A slight difference in tone may, however, often be observed, and in var. *narina* there is a distinct inclination towards the colour of the Amoor specimens. On the underside the variation in the ground-colour is not so great, the contrast between even the lightest and darkest specimens being less than occurs in any of the British Plebeids, though darkish forms are common in the mountains. The spotting of the underside is generally large and bold, though the size of the spots differs considerably. The whole submedian series is frequently present, the costal spot on the forewing appearing far more commonly than in any other British species, though cases of obsolescence may be found in this series even to complete extinction. Short, however, of such cases, the loss of the eyespots on the forewing very rarely advances further than to leave the five central spots of the series. The first to disappear is, of course, the small costal spot, next, the lower half of the double spot on the inner margin, and lastly the upper half of the same spot; we have, in fact, only come across one specimen of further obsolescence (without complete absence of the series), and this on the right wing only, in this case the two spots remaining are the third and fifth from the costa. In the same specimen, from the Brit. Mus. coll., the hindwings lack the costal and double inner-marginal spot, but this is the only case (short of absence of the entire series) in which we have observed the loss of any of the submedian series, except that the innermarginal spot is sometimes single. On the upperside, where, even on the forewing, the presence of the whole series of 8 spots is exceptional, the disappearance of the costal spot

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\* This would seem probably to be the case also with the ab. *grisea*, described by Courvoisier (*Mitt. Schw. Ent. Ver.*, xii., pt. 2, p. 294) as being light grey with a very pale rosy reflection; this must almost necessarily imply a colour-change in the scales themselves [G.W.].



comes first, and, even when it is present, which is very rarely the case, it is very small and somewhat indistinct; next goes the lower, and then the upper half of the inner-marginal spot, and then the subcostal, though the latter is exceptionally absent when the upper part of the innermarginal is present; then the spot next above the innermarginal disappears, then that next below the subcostal; if only one is left, it is generally the fifth from the costa. Normally there is only one basal spot on the forewing, but the absence of this is not unusual, while on the other hand, two, and even three, are far from rare. On the hindwing three is the normal number, but in almost any long series anything from none to four may be expected, and the presence of a fifth is far from rare. The double marginal row of spots varies much in intensity and distinctness, and is occasionally reduced to a single row, as in var. *rühli*. Both the *discreta* and *glomerata* forms are found but not to any noticeable degree, and the latter is commoner than the former. We have already referred to the frequency of elongation or enlargement of the spots on the upperside of the forewing; this is most usually in the form of long pear-shaped spots, often without any great increase in the width (ab. *imperialis*), but sometimes also the spots become greatly widened (ab. *fasciata*), without being necessarily elongated to any great extent. In the case of extreme elongation of these spots the basal spots are frequently present on the upperside, and a usual form of aberration is the junction of the upper half of the inner-marginal spot with the lower basal (ab. *conjuncta*, n.ab.), which gives the insect a very richly marked appearance. Enlargement of the eye-spots on the underside, especially in the forewings, is common, and in some southern localities is racial (e.g., var. *ligurica*); very rarely the submedian series is joined to the marginal almost in figures of eight (ab. *coalescens*). Any considerable enlargement of the submedian series on the hindwing is much more uncommon, but is occasionally met with. The full series of these spots is never, in our experience, present on the upperside of the hindwing, even in vars. *narina* and *amurensis*, whilst on the underside it is the most constant of the markings, except in var. *tatsienluica*, where it is obsolescent. The extent and tint of the blue basal suffusion on the underside hindwing varies considerably, especially in the Oriental specimens (var. *cyaneacula*), in which it sometimes covers almost the whole hindwing, but the difference between these and ordinary European specimens is not greater than in examples of *Glaucopsyche cyllarus* in the Rhone Valley. In exceptional cases the suffusion in Alpine specimens (e.g. in the Laquinthal and the Gondo Gorge) extends even somewhat beyond the submedian series of spots, but it is of a darker blue than in var. *cyaneacula*, and quite without the greenish tint usually displayed by the latter. There is considerable variation also in the fringes, which are generally white on the upperside and chequered for the inner half on the underside, but they are occasionally as dark as the outer-margin in melanistic specimens. They are generally narrow and inconspicuous, except when, as sometimes happens, a specially white fringe contrasts with an unusually dark border.

In England the Cornish race differs considerably in the general appearance of a series, and, indeed, in the large majority of individuals, from those from other parts of the country. It is distinctly paler, and



consequently the markings show more clearly out from the ground-colour. The hind margin of the hindwings is more frequently obsolete (ab. *caeruleo-marginata*, n.ab.) than in any other race (unless possibly in var. *amurensis*, of which we have seen too few specimens to enable us to judge, though in one example this obsolescence is complete and in another almost so.) The Cotswold variation has been exhaustively worked out by le Chamberlain (*Ent.*, xli., p. 202), though one or two of his names are synonyms. This race is certainly duller than the Cornish as a whole, though some specimens of his ab. *imperialis* would seem to be quite light; this fine ab. also occurs among the Cornish examples. Very small specimens seem commoner here than elsewhere. Apart from this fact we find no difference between the Cotswold examples and the few we have seen from Huntingdonshire, Bedfordshire and Northamptonshire; the Devonshire specimens rather resemble the Cornish, though generally darker, and we should be disposed to regard the British specimens as generally dividing into two races the midland and the south-western, though the distinction is not sharply defined, and specimens of either locality might have come (exceptionally) from the other. In Brittany Oberthür remarks that the specimens are much like English ones, and it might have been added like both forms of English ones; elsewhere in France, as might be expected from the great differences in climate and altitude, very different forms are found, from the large, light form of the Riviera (var. *ligurica*) to the dark var. *obscura* of the Alps and Pyrenees, and the minute and dark var. *delphinatus* of some parts of the Dauphiné; but in all these cases there is a remarkable mixture of specimens. From the Gironde come pale specimens, with the black replaced by rusty brown. In Switzerland there is almost as wide a range, except that the lightest race, var. *arcina*, is only a transition to var. *ligurica*, and the mountain var. *obscura* is rarely as small as var. *delphinatus*. In Germany and Austria, again, the range is very wide, but none of the German forms are as light as those from the Riviera, though the var. *laranda* from the South Tyrol is a light form, and the examples from the Harz Mountains do not seem to be as dark as those from the Alps; the lightest German specimens we have seen are those from Frankfort, these are very close to the Cornish race, but somewhat larger. Northern specimens are, as a rule, somewhat dark in colour, and we should suspect them of mostly belonging to le Chamberlain's ab. *cotswoldensis*. The range of variation in Italy is as great as, or greater than, in Switzerland, though outside the Alpine area the species is scarce and local. The var. *ligurica* was, as the name implies, originally described from the Italian Riviera, though it extends along the French coast and even into the Alps at Entrevaux and the Pyrenees at Vernet. Very varied forms come from the Southern slopes of the Alps, even including the almost entirely black ab. *aldrorandus*, the original specimen of which was taken at the foot of Vesuvius. We have little information about the forms from the Apennines, where it is scarce, but Wheeler reports (*Ent. Rec.*, xxii., p. 281) that at Palena and Roccaraso, at about 4,000ft., in the Abruzzi, the specimens are rather small and dark, but not approaching the blackness of var. *obscura*; these again are no doubt to be referred to ab. *cotswoldensis*. Mrs. Nicholl's specimens from Bosnia include a wide range of variation, there is a ♂ obviously of the ab. *unicolor*, a ♀ referable to ab. *aldro-*

*vandus*, and another ♂ as dark as the ab. *unicolor*, but rather heavily spotted. From the Rilo Dag, on the other hand, they are lighter, the ♀ exceptionally light, probably to be referred to ab. *laranda*. From Roumania Fleck reports the forms *jasilkowskii* and *unicolor*, both of which were originally described from Bukovina by Hormuzaki, the former is small with a narrow border and obsolescent spotting, the latter, also obsolescent in spotting, and with dark dull blue unicolorous ground. Graves reports (*in litt.*) that in the neighbourhood of Constantinople he has only found the species near *Therapia*, that the specimens are fairly large (42-46mm.) and lightly coloured, but less so than British examples. From Parnassus come dark specimens, quite of the *obscura* form and varying very much in size. The Urals produce two races which do not, however, differ very greatly, the single marginal row of spots on the underside in var. *rühli* being only an exaggerated form of the obsolescence of these spots in var. *uralensis*. Absence of the basal spots of the hindwing, which occurs more or less completely in var. *rühli*, is also typical of the specimens from other parts of Eastern Russia, while those from St. Petersburg are quite normal in this respect (Kroulikovsky). The Asiatic races are all marked by the extent of the blue (somewhat greenish-blue) suffusion of the underside of the hindwings, which in extreme cases touches the marginal line of spots. In other respects they vary much as do the European in the amount of black suffusion in the upperside and in the character of the spotting. Many are as dark as var. *obscura* and, in fact, only differ from the European forms of this variety by the characteristic suffusion beneath. The Thibetan var. *tatsienluica* is, on the other hand, large, pale, and with very obsolete spotting. Certain Asiatic races, moreover, are aberrant in two further directions, the ground-colour and the shape of the wings. In var. *amurensis*, from the Amoor, the ground-colour is a dull lavender-grey over which is a sprinkling of scales of the normal colour; var. *nariina* from East Turkestan also shows some approach to this colour. In the latter the wings seem somewhat narrow and elongated, but this peculiarity is much exaggerated in var. *amurensis*, unless, indeed, Graeser's specimens from Pokrofska belong to the former variety. As he says they differ little in colour from Herrich-Schäffer's figure of *cyaneacula*, they would seem to belong there, though both the shape of the wings and the locality would rather have appeared to connect them with var. *amurensis*.

#### ORIENTAL FORMS.

These being the most distinctive we will consider them first. They differ greatly in other respects, but are alike in the greenish-blue tint and the extent of the suffusion on the underside of the hindwing.

(a) var. *cyaneacula*, Evers., "Bull. Soc. Nat. Mosc.," pt. 3, p. 207 (1848); Dbldy. and Westw., "Gen. Diurn. Lep." ii., p. 491 (1852); Led., "Verh. zool.-bot. Gesells.," ii., p. 20 (1852); Gerh., "Mon.," p. 19, pl. xxxvi., figs. 2 a, b (1852); H.-Sch., "Syst. Bearb.," vi., p. 25, pl. cxxiii., figs. 593, 4 (1856); Staud., "Cat.," 1st ed., p. 6 (1861); 2nd ed., p. 14 (1871); Kirby, "Syn. Cat.," p. 374 (1871); Graes., "Berl. Ent. Zeits.," p. 81 (1888); Dale, "Hist. Brit. Butts.," p. 60 (1890); Brom., "Butts. Riv.," p. 45 (1892); Staud., "Rom. Mém. Lép.," vi., p. 165 (1892); Rühl, "Pal. Gr.-Schmett.," pp. 308 (1893), 769 (1895); Tutt, "Brit. Butts.," p. 158 (1896); Elwes, "Trans. Ent. Soc. Lond.," p. 329 (1899); Staud., "Cat.," 3rd ed., p. 98 (1901); Lamb., "Pap. Belg.," p. 254 (1902); Courv., "Ent. Zeits.," xxiv., p. 202 (1910); Seitz, "Gr.-Schmett.," p. 321, pl. lxxiii., c (1910).—*Alae superne caeruleae punctis ordinariis maculatae margine externo nigro, ciliis albis nigro-*

variis, subtus antice fusco-cinereae, punctis ordinariis nigris; posticae cyaneo-aeruginosae margine externo cinereo, punctis ordinariis nigris. ♂.

On the upper side this butterfly scarcely differs from strongly blue coloured males of *L. arion* except that the white fringes are chequered with black, and the size is also similar. On the upper side the wings are the same blue colour as in *arion* ♂, but the black border is rather narrower than in the latter, the spots on the underside are mostly visible above, and are as large and oval as in *arion*, first a single spot near the base, then the usual central spot or lunule, and then the waved row of black spots; the two rows of spots on the underside near the hind margin are wanting on the upperside because the margin is there black. The hindwings on the upper side are similar to the forewings, blue, with a black border, and a black central lunule, but only a few spots of the curved row are visible. The fringes of all the wings are white, and are less extensively chequered with black. On the underside the forewings are also like *L. arion*, and the spots or dots are the same, only their shape is different, in *arion* they are round or oval, but here cap-shaped, or like a half oval. The principal difference of this butterfly is to be found on the underside of the hindwings; these are verdigris-green from the base almost to the hindmargin shading into Prussian blue; only the outer margin between the two last rows of spots is grey. The black spots are small, and have the same position as in *arion*.

The butterfly flies in Eastern Siberia in the neighbourhood of Kiachta. The female is unknown to me. (Eversmann.)

This colouring of the underside hindwings forms the distinctive character of the Eastern races. As more examples of *cyaneacula* have come to hand, it has gradually appeared that almost every kind of aberration known in the different European forms of *arion* is also to be found in *cyaneacula*. The most remarkable divergence, however, is in the shape of the wings, which, in some districts are long and narrow, giving the insects a very distinctive appearance. Graeser, indeed, took three specimens at Pokrofska of which he wrote (*Berl. Ent. Zeits.*, p. 81, 1888):—"It is absolutely impossible for me to make up my mind to class this remarkable insect as a var. of *arion*, L.; so far as the marking and colouring is concerned, my specimens show great correspondence with the drawings of Herrich-Schäffer (593, 4) but the shape of the wings is totally different from these figures. The wings are very long and narrow, the apex of the forewings coming very far forward; also the outer margin of the hindwings between nervures 4 and 6 is much more drawn out into an angle than is the case with *arion*, which has the wings much broader and more rounded than these three specimens from Pokrofska. The fringes in these latter are more regularly chequered black and white than the almost unicolourous white fringes of *arion*. The antennæ in *cyaneacula* are much darker and not regularly mixed white and black as in *arion*; they are black and very finely mixed with light brown." Staudinger, however, pointed out (*Rom. Mém. Lép.*, vi., p. 115) that the form of the wings frequently varies in specimens of the same variety from the same locality, and that he had examples of *cyaneacula* with wings both of the shape described by Graeser, and of the ordinary shape of *arion*. He adds:—"The only constant distinction of *cyaneacula* consists in the almost green-blue underside of the hindwings, and this likewise appears in gradations, and I have no doubt that it is only a local form of *arion*."

In the Brit. Mus. Coll. are examples with every degree of this blue-green suffusion, from some in which it scarcely, if at all, exceeds that displayed by some European specimens of *arion*, to others in which it covers the whole wing up to the inner row of marginal spots. It is, however, always of a greener and lighter blue than in European examples.

Of this variety Elwes (*Trans. Ent. Soc. Lond.*, p. 329, 1899) says: "I found this only in the Lower Bashkaus Valley, at the south of Lake Teletskoi, where it was fresh at the end of July. Berezowsky also found it at Ongodai. The specimens are very variable in size, but may be distinguished, like those I have from Irkut, from Turkestan, and from Amdo, by the much greater average extension and brightness of the blue at base of hindwings below. This is found to some extent in *arion*, especially from southern localities, such as the Pyrenees and Armenia, but never (in my specimens) extends to the margin."

(β) var. *narūna*, Courv., "*Ent. Zeits.*," xxiv., p. 202 (1910).—Expanse never under 32mm., in many up to 40 or even 42mm. Wings in all, ♂s and ♀s, very narrow and elongated; the border of the forewings, even in the ♀s, very little rounded and running on a considerable slope. Ground-colour in both sexes a remarkably light grey-blue; in the ♀ the forewings are overspread with a deep smoke-grey while the hindwings are still distinctly blue. In place of the broad black band usually running round, appears only a fine black line, even in the ♀s, which sends out small teeth into the white fringe; on the inside of this, along the whole border of both wings, are dark marginal spots in each cell, bordered with light; the median spots (6-7 on the forewings, 3-5 on the hindwings) are very marked on both wings. The underside of the forewings is both in colour and markings like typical *arion*, on the whole a little darker, the hindwing shows in both sexes a strong and extended basal dusting of verdigris-green as in *cyaneacula* (Courvoisier).

Loc. Narūn, from which two or three dozen specimens were received.

There is a pair in the Brit. Mus. Coll., from the Alexandroffsky Mtns. exactly corresponding to this description. It must be regarded as the local race of South-east Turkestan. It is a very distinct form, and may possibly prove, together with the following, to be a separate species; on the other hand, the close connection with var. *cyaneacula*, which is certainly a form of *arion*, is indubitable, and the probabilities are strongly in favour of placing it, as Courvoisier has done, as a local race of the latter.

(γ) var. *amurensis*, n. var.—Ground colour of all the wings light grey blue, somewhat resembling that of *Latorina orbitulus*; the wings even longer and narrower than those of *narūna*. The border in both sexes reduced to a thin dark line; the darkish marginal spots small and ringed with lighter grey, internally on the forewings and on both sides on the hindwings. Forewings with large black spots, forming a macular band in the ♀, hindwings with smaller black spots. Underside hindwings with the colouring of *cyaneacula* but rather faint; spots large on the forewing, small on the hindwing. Fringe spotted.

In the Brit. Mus. Coll. is a short series from the Amoor district consisting of 3 ♂s and 2 ♀s (the only specimens from this locality) with the very distinct facies described above. The remarkable ground colour of the upperside is caused by lavender-grey scales with a strong admixture of blackish ones and a few scales of the usual blue of *arion*. The specimens have somewhat the appearance of having been changed by some chemical action, but a careful examination with a powerful lens has convinced us that this is not the case, the admixture of scales of the ordinary blue coloration rendering this practically impossible.\*

Apart from the ground colour, which is common to all, there is considerable variation in detail in the specimens. The marginal spots on the hindwing are obsolescent on the upperside in one ♂ and obsolete

\* The washed out colour of ab. *pallida*, le Chamb. (*v. infra*) points in the same direction, and it is made yet more certain that this colouring is natural by the fact that a specimen of *arion* has lately been described (ab. *grisea*, Courv., (*v. infra*), from the Riviera, in which the colouring is similar. (G.W.)

in one ♀. One of the ♀s has a broader dark band on the forewings on the upper side which partially conceals the marginal spots, the other has two basal spots on the upperside forewings the lower of which is joined to the last of the submedian series, the whole series in both being more elongated than in the ♂s. On the underside one ♂ and one ♀ are without the basal spot on the forewings. They are of very uniform size the ♂s expanding 42 mm., the ♀s 44 mm.

The shape of the wings is that of Graeser's three specimens described above, which also came from the Amoor district, but the colouring of Herrich-Schäffer's figure is quite different, though not so unlike the colour of var. *nariina*, which has much the same shaped wings.

(δ) var. *tatsienluica*, Obth., "Lép. Comp.," iv., p. 328 (1910), vi., pl. cxxvi., figs. 1121,2 (1912).—The ♂, above, is entirely blue, without black spots; the ♀ is clouded by the blackish tint, and is spotted with black on the upperside of the forewings. Beneath, the hindwings are very broadly covered with a greenish dusting and the usual black spots are very small (Oberthür).

Loc. Ta-tsien-Lou (Thibet).

[The plate shows a bright blue ♂, with very narrow black border with slight whitish lunular spots within it, and a small black discoidal spot on the forewing; the hindwing affords slight traces of spotting within a yet narrower black border; the underside has large spots on the forewing but is without a basal spot, the green suffusion on the hindwing extends as far as the marginal spots which are more distinct than those on the forewing; there are three basal spots. The ♀ has a broad dark border, blacker towards the edge of the wing, a well-marked black discoidal spot and a series of 5 submedian spots on the forewing, but no spotting on the hindwing; the underside shows a well-spotted forewing, the basal spots, however, being absent on both wings, and the green suffusion only extends to the submedian series, the second and third spots of which (counting from the inner margin) are suppressed. The wings are of the usual *arion* shape, not long and narrow as in the last two forms. (G.W.)].

(e) var. *uralensis*, [Gr.-Gr. ? M.S.], Elwes, "Trans. Ent. Soc. Lond.," p. 329 (1899).—In the var. *uralensis*, Gr.-Gr., of which six pairs are now in my collection, both sexes are much darker and more uniform in colour than in Western Europe, and have the underside as in *arion* and not in *cyaneacula* (Elwes).

We have been quite unable to trace this name to Grum-Grshimailo, except in MS. Of the six pairs mentioned above, five are now in the Brit. Mus. coll., and from these we take the final observation quoted above as to the underside to mean that the suffusion does not surpass in extent the more pronounced cases of *arion*, and that it never reaches the marginal spots as it does in extreme cases in *cyaneacula*. All the ten specimens in the Brit. Mus., seem, however, closer in this respect to the Eastern than to the Western forms. The ♂s are all very lightly spotted on the upperside, in one case only the discoidal is present, and in another case even this is absent; they are of very dark colouring, approaching the var. *unicolor*, Horm., but owing, in this case, to the encroachment of the dusky border. The ♀s are well spotted on the forewing on the upperside, but have no spots on the hindwing. On the upperside they are much like some specimens of the var. *obscura*; in the obsolescence of the marginal spots on the underside they approach very closely to the following form.

(f) var. *rühli*, Kroul., "Soc. Ent.," xii., p. 1 (1892); Rühl, "Pal. Gr.-

Schmett.,” p. 308 (1893); Tutt, “Brit. Butts.,” p. 157 (1896); Spul., “Schmett. Eur.,” p. 69 (1902); Lamb., “Pap. Belg.,” p. 254 (1902); Courv., “Ent. Zeits.,” xxiv., p. 202 (1910).—*Varietati obscura* Christ, ut videtur, proxima. Alae supra nigro fuscae, in disco parum caeruleo pulveratae, maculis cuneiformibus anticarum aterrimis, fimbriis grisescentibus. Subtus a forma typica differt his; serie marginali punctorum nigrorum simplici, non duplici, punctisque basalibus in alis posticis, ad basin laevissime virescentibus, subdeficientibus. Femina a mare differt magnitudine alarumque nigredine (Kroulikovsky).

The peculiarity of this form is in the marginal spots of the underside, which form a single, instead of a double row, the basal spots of the hindwing being also reduced in number or entirely absent. The upperside resembles var. *obscura* in its more extreme forms, the hindwings being entirely suffused with brownish black, and the forewings alone showing a powdering of bright blue on the basal half, more marked in the ♂ than in the ♀. The powdering on the underside hindwing is slight, but in its green tint approaches more nearly to the other Oriental than to the Western forms. This variety comes from the spurs of the Southern Urals in the Govt. of Ufa, but the absence or obsolescence of the basal spots of the hindwing is also noticeable in specimens from the districts of South-west Russia, *e.g.*, from the Govts. of Kasan and Viatka. This fact, in connection with the oriental affinities of its neighbour, var. *uralensis*, has induced us to place these two varieties among the Eastern, rather than among the mountain forms, where they would also have been appropriate.

#### FORMS CHARACTERISTIC OF THE SOUTH.

The peculiarity of the southern forms of *arion* is a general lightening of the ground-colour both on the upper- and the undersides. We have classed these forms together on account of their general similarity, and have therefore included var. *arcina*, Frühst., although the district from which it comes is not, strictly speaking, a southern one. On the other hand, the specimens from the Apennines and from Parnassus do not resemble these in the lightness of their appearance, but it must be borne in mind that these latter are mountain forms, whereas the light-coloured varieties described below are from hot localities, and, generally speaking, from low levels.

(a) var. *ligurica*, Wagn., “Soc. Ent.,” xix., p. 1 (1904); Rebel, “Berges Schmett.,” p. 76 (1909); Seitz, “Gr.-Schmett.,” p. 321 (1910); Frühst., “Int. Ent. Zeits.,” iii., p. 55 (1910); Courv., “Ent. Zeits.,” xxiv., p. 203 (1910); Obth., “Lép. Comp.,” iv. p. 325 (1910).—Plerumque major, alis omnibus supra et subtus dilutioribus, maculis permagnis, alis posterioribus supra ocellis antemarginalibus nigris albo cingulatis (Wagner).

This form, which appears to be racial, or at least dominant, on the coast of the Riviera, from Bordighera to San Remo, is distinguished by its lighter ground colour on both sides, and by the increased size of the spots both above and below; so light, indeed, is the ground-colour on the underside that the pale rings of the spots are almost invisible. Its special distinction, however, is that the antemarginal spots on the upperside of the hindwing are ringed on the inside with whitish. The dark antemarginal lunules on the forewing also stand out conspicuously in consequence of the almost complete absence of the black border in the ♂ and its very slight darkening in the ♀.

This form, though dominant on the Riviera, is not confined to that district, or even to low levels. Oberthür, (*Lép. Comp.*, iv., p. 326)

says that he has specimens from Vernet-les-Bains quite of this variety, though the usual form of the Pyrénées Orientales is smaller and darker than the average, he also has a ♂ from Entrevaux quite of this form, though side by side with it occur extremely dark specimens. The Corsican specimens from Saint-Pierre-de-Venaco are also, on the same authority, to be placed here.

(3) var. *arcina*, Frühst., "Int. Ent. Zeits.," iv., p. 55 (1910).—We have in the neighbourhood of Geneva a splendid transition to the geographical race of the Italian Riviera, described by Wagner as *ligurica*, which I may call *arcina*, after its locality at the "Perte du Rhône." *Arcina* is considerably larger than the ♂ and ♀ from the Harz Mountains and Upper Bavaria, with a light blue shining ground colour on the upper side which calls to mind *ligurica*; the ♂ almost without black discal spots, the ♀, with sharply defined median spots on a whitish-blue ground, as in *ligurica*. Underside paler than German examples; the black median spots larger, without reaching the size of the spots of *ligurica* (Frühstorfer).

Loc. Chancy near Geneva, Eclépens, Veyrier.

This is a fine bright form, but has no claim to be called a "sub-species," the title attached to the original description; it is not even strictly a local race, since many specimens occur on the same ground of quite ordinary lowland form. It is, however, correctly described as a transition to *ligurica*.

(γ) var. *laranda*, Frühst., "Int. Ent. Zeits.," iv., p. 55 (1910).—Near the alpine subspecies *obscura*, Christ, but considerably larger. . . . Examples with entirely black upperside, such as I have found of *obscura*, seem never to occur in *laranda*; the shining blue surface, of a lighter and more intensely lustrous blue, generally extends as far as a narrow, sharply defined bordering line. The underside is characterised by the more pronounced black spots, especially on the disc of the forewings, and by the lighter grey ground colour. *Laranda* might well stand as the largest race of European Lycaenids (Frühstorfer).

Loc. South Tyrol, the neighbourhood of Klausen and Atzwang.

It is impossible to guess in what respect this form approaches *obscura*, since the description flatly contradicts every peculiarity of the latter. It is large instead of small, peculiarly bright blue, with a narrow border instead of being very broadly suffused with black, and has a light grey underside instead of a dark one. Its claim to be regarded as a "sub-species" rests on 2 ♂s and 3 ♀s taken in July, 1904!

(δ) ab. *magnifica*, Heyd., "Ent. Zeits." xxiii., p. 177 (1910); Frühst., "Int. Ent. Zeit.," iv. p. 55 (1910).—Distinguished not only by its size, but also by the remarkably blue tone of its upperside, and the enlargement of the eye-spots on the underside. . . . All the wings rather broader and rounder. Upperside dark blue, with a band 5mm. broad; fringes snowy white; large deep black spots (Heydemann).

Frühstorfer says that this is only a specially fine example of his *laranda*, and that he would have accepted the name were it not that it is not available for a subspecies (as he calls *laranda*), being already the name of another species of *Lycaena*, that which was later named *superba* by Staudinger. Grum-Grshimailo's name should certainly stand for this latter, as it has a two year's priority and there is really no doubt as to the species to which it was given. This would not, in our view, invalidate the name for a variety of *arion*, and we here retain it, the difference in the border on the upperside, which in *laranda* is narrow and in *magnifica* 5mm. in breadth, would make the latter an ab. of the former variety.

(ε) ab. *punctifera*, Grund, "Int. Ent. Zeits.," ii., p. 87 (1908). *Arion*, ab., Bohatsch, "Jahresb. Wien. Ent. Ver.," xi., p. 34 (1892).—I designate as ab.



*punctifera* shining light blue examples with weak black marking, in which the black border of the forewings is narrow, and on the hindwings appears only as a black bordering line, inside which are black spots in undefined white circles. On the forewings also are black marginal spots; here, however, they are mostly obsolete, or partially melt into the border (Grund).

Loc. Podsused, not scarce, environs of Lipik.

No mention being made of the underside, it may be presumed that it does not differ materially from the type, and is therefore distinct from var. *laranda*; the weak black marking also differentiates this form from var. *ligurica*.

#### MOUNTAIN FORMS.

The mountain forms are distinguished by their dark colouring due to an enlargement of the black border, often extending to the centre of the wings, and in extreme cases almost to the base. These dark forms, though characteristic of the mountains, are not confined to high levels, and, on the other hand, quite light forms, even the pale var. *ligurica*, may be found in mountain localities.

(a) var. *obscura*, Christ., "Frey's Lep. Schweiz," p. 22 (1880); Lang, "Butts. Eur.," p. 134 (1884); Kane, "Eur. Butts.," p. 52 (1885); Kill., "Beitr. Ins. Gräüb.," p. 6 (1886); Rühl, "Pal. Gr.-Schmett.," pp. 303 (1893), 769 (1895); Tutt., "Brit. Butts.," p. 157 (1896); Favre, "Macr. Léop. Val.," p. 25 (1899); Staud., "Cat.," 3rd ed., p. 90 (1901); Spul., "Schmett. Eur.," p. 69 (1902); Lamb., "Pap. Belg.," p. 253 (1902); Wheel., "Butts. Switz." etc., p. 22 (1903); Rebel, "Berges Schmett.," 9th ed., p. 76 (1909); Seitz, "Gr.-Schmett.," p. 321, pl. lxxxiii., c (1910); Courv., "Ent. Zeits.," xxiv., p. 202 (1910); Obth., "Lép. Comp.," iv., p. 326 (1910). *Caucasica*, Elwes, "Trans. Ent. Soc. Lond.," p. 329 (1899). *Arion*, ab., Meisn. "Natur. Anz.," i., p. 86 (1818); Zell., "Stett. Ent. Zeit.," xxxiv., p. 295 (1872).—In the Alps and indeed at a moderate elevation, smaller specimens are met with, with the wings more and more darkened with blackish; these form the variety *obscura*, Christ, which is met with from Zermatt to the Stelvio. A similar dark specimen was received exceptionally from the Liestal by Dr. Christ (Frey).

Typical *obscura* are here specially noted as being smaller than the type, but it must be remembered that Swiss specimens are often large, and that Frey had just been mentioning "the particularly large and fine specimens found in the Leventina." It may also be observed that in the Brit. Mus. Coll. are specimens of *obscura* from the Frey coll., and many of Zeller's specimens from Bergün, well up to the average size of British *arion*. On the other hand, the earlier records of these dark specimens, both Meisner's as early as 1818, and Zeller's as late as 1872, refer to their small size. Meisner observes:—On the Alps one frequently finds a far smaller aberration, in which the ♀, especially, is, on the upperside, almost black, and only slightly powdered with blue." Zeller, again, writes as follows:—Not very numerous [at Bergün] on open mountain meadows in the first half of July. I never took it to be *L. arion*, and as I did not want to take bad specimens away with me, I consequently only have a male before me, which I only now recognise as belonging to *arion*. It is like the rest of the specimens which I saw there, much smaller than our *arion*, the ground colour of the upperside of the wings is black, and penetrates everywhere through the faint light bluish dusting except at the base, so that the blue is considerably toned down. The black spots of the front wings are of the ordinary number, but small and, since here the blue dusting is very faint, only slightly distinguishable. The black hind margin also differs much and is hardly recognisable as the marginal line of the



hind wings. On the underside the eye-spots are small and not otherwise remarkable. The eye-spot between the transverse spot and the base of the forewings, ensures the classification of the species as *L. arion*. It is evidently the alpine variety described by Meisner.

The name *obscura* seems first to have been published in Frey's *Lepidoptera der Schweiz*, but he here quotes it as "Christ;" it was probably only a MS. name of the latter, but this is not certain, and in view of the fact that this variety is almost universally known as "*obscura*, Christ," it seems better to retain it under this authorship.

Since some of the largest known specimens belong to this dark mountain form, and since they are indiscriminately referred to, both in books and magazines, whether English or Continental, as var. *obscura*, to which they do not, strictly speaking, belong, we have thought it well, in order to avoid confusion, to name this large form:—

( $\beta$ ) ab. *obscura-major*, n. ab. *Obscura*, auct., in part. *Arion* var., Gerh., "Mon.," pl. xxxviii., figs. 1a, b (1852).—Large specimens blue at the base, the dark border extending inwards to the discoidal spot or further, the inner portion of the dark suffusion often more or less powdered with blue.

In the majority of cases it is quite impossible to separate to *obscura* (*sensu stricto*) from those which include this larger form, and it must be understood that our further observations on the dark form usually characteristic of the mountains are to be taken as referring indiscriminately to the larger and smaller specimens, which, in almost all localities, fly together, and amongst which there is generally also an admixture of lighter examples to be found, which would, for the most part, fall under the description of ab. *cotswoldensis*, le Chamb.

Almost every form of aberration which occurs in the lighter races, of course excepting those which depend on the ground-colour of the upperside, is also to be met with in ab. *obscura*. We have not considered it needful to name these separately, since they can always be readily identified by prefixing the word *obscura* to the aberrational names, e.g., *obscura-coalescens*, *obscura-bipuncta*, *obscura-imperialis*, etc. Those just mentioned, together with the abs. *basipuncta* and *conjuncta*, are specially liable to occur in these suffused examples; on the other hand, the aberrations due to partial or complete obsolescence of the spots, both on the upper and undersides, are also taken not uncommonly. The distribution of this variety is very wide, embracing the Alps, the Pyrenees, and the Caucasus, as well as the Carpathians, the Urals, and the mountains of the Balkan Peninsula, in the last three cases, however, the more specialised vars. *unicolor*, *jasilkowskii*, *rühli* and *uralensis* are predominant. Amongst the Asiatic specimens also, which fall, in consequence of the blue-green suffusion of the hindwings on the underside, under the var. *cyaneacula*, are many examples which on the upperside have all the characteristics of *obscura*; these may well be denominated *cyaneacula-obscura*.

We have been unable to trace the name *caucasica* further than Elwes' paper in the *Trans. Ent. Soc. Lond.* for 1899, though he does not use the name as if it were employed for the first time. He observes (*loc. cit.*) that "the var. *caucasica* seems too inconstant to bear a varietal name," and, in fact, the specimens in the Brit. Mus. Coll. are indistinguishable from those of the Alps, except that there is rather more suffusion on the underside of the hindwings than is usual in western

specimens, though we have seen exceptional examples from the Alps (*e.g.*, from the Laquintal) exhibiting more of this suffusion, though of a more distinct blue, than we have seen in any of the examples from the Caucasus that we have had the opportunity of examining.

( $\gamma$ ) var. *jasilkowskii*, Horm., "Verh. Zool.-bot. Gesells.," xlvii., p. 138 (1897); liv., p. 433 (1904); Fleck, "Macr.-Lep. Rumän.," p. 24 (1901); Spul. "Schmett. Eur.," p. 69 (1902); Rebel, "Berges Schmett.," 9th ed., p. 75 (1909); Seitz, "Gr.-Schmett.," p. 321 (1910). *Euphemus*, Horm., "Unters. Lep. Buk.," p. 177 (1894).—A peculiar local race of *L. arion* is abundant in the Alpine region [of Bukovina]. All the 8 specimens before me (7 ♂ 1 ♀) are similar, only 32-35mm. in expanse. The black border is narrower than usual, all the spots are small and indistinct, often punctiform, and on the hindwings absent. But the principal difference is that the characteristic ocellated spots of *arion* on the underside of the forewings in the discoidal cell between the discoidal spot and the base are entirely absent. I call this local form *jasilkowskii*, in honour of Herr Jasilkowski, from whom I received a number of specimens. As early as August 5th, 1894, I found this variety on the Alpine meadows of Lutschina, and hence the erroneous reference in my *Untersuchungen über die Lepidopteren der Bukowina*, p. 177. On August 3rd, 1894, Herr Jasilkowski caught a specimen at Munceln, and 6 fresh specimens at Raren, all in the Alpine region (Hormuzaki).

Later (Verh. zool.-bot. Gesells., xlvii., p. 138), Hormuzaki wrote as follows, in consequence of Staudinger's action (*Catalog*, 3rd ed., p. 90) in making *jasilkowskii* a synonym of *obscura*, from which it is entirely different:—"This is not darker than the type, though smaller, with a narrower black border and small spots; the most important character is, however, the total absence of the spot in the median cell of the underside of the forewings, on account of which I first considered this variety as a form of *euphemus*."

This is really an obsolescent form, both on the upper and undersides. It is doubtful whether it should really be included among the mountain forms, since it is rather a hill than a mountain race, and its characters are not those of the other mountain forms; still less, however, do they seem to show affinity with the other southern forms, and the only alternative would be to place it in a category by itself. It occurs in the Alpine region of Bukovina, and Fleck also reports it from Roumania.

( $\delta$ ) ab. *unicolor*, Horm., "Ent. Nacht.," xviii. p. 1 (1892); Rühl, "Pal. Gr.-Schmett.," p. 308 (1893); Tutt, "Brit. Butts.," p. 158 (1896); Fleck, "Macr.-Lep. Rumän.," p. 24 (1901); Spul., "Schmett. Eur.," p. 69 (1902); Lamb., "Pap. Belg.," p. 254 (1902); Rebel, "Berges Schmett.," 9th ed., p. 75 (1909); Seitz, "Gr.-Schmett.," p. 321 (1910).—This aberration is at once distinguished from the typical form by a conspicuously darker blue ground-colour. All the wings are often still more darkened because the blackish brown colour of the border extends further inwards. On the forewings the spot on the discocellular nervures (transverse nervures) is only very faintly indicated, and is sometimes quite absent, the other black spots are absent except a very indistinct spot between the second and third median nervures (cell three). The hindwings are quite unicolorous (as far as the darker border) but in many specimens the black spots on the transverse nervures, and in cells 3, 4, and 5, are indicated by indistinct dots, which are, however, rendered very faint by the very dark ground colour which we have already mentioned. The underside agrees entirely with the typical form (Hormuzaki).

Hormuzaki adds that this aberration is often met with, more or less distinctly marked, at Crasna in Bukovina, among ordinary specimens of *arion* in meadows, especially at the borders of woods, at a height of 1,500 to 2,650ft. above the sea. Fleck also reports it from Roumania. It is a somewhat extreme form of *obscura*, with hindwings completely suffused and forewings broadly suffused, sufficient blue

scaling remaining to give the effect of very dark blue ground colour, the black border of the hindwings, and often some of the spots remaining visible.

( $\epsilon$ ) var. *delphinatus*, Frühst., "Ent. Zeits.," xxiv., p. 144 (1910).— $\sigma$  very small, not reaching the smallest of my 34 alpine *obscura*. Upperside altogether recalling *alcon* rather than examples from Savoy or Hungary. Also without the heavy black spotting of *obscura*. Underside to correspond, and darker grey than in *obscura*, with remarkably small spots, again inclining to *alcon*. A distinct race, the like appears to come from Digne (Frühstorfer).

Loc., between La Grave and the Col de Lautaret.

This is another of Frühstorfer's so-called sub-species, founded on 4  $\sigma$ s taken by him in July, 1910; Oberthür, however, so far supports the view that it is dominant at the Col de Lautaret as to remark (*Lép. Com.*, iv., p. 326) on the small size and dark colouring of specimens from this locality. Small specimens occur at Digne, but they are often light, and very large ones occur there also. They are reported by Rowland-Brown as varying greatly both in size and colour from this locality. *Delphinatus* is, in fact, a very small obsoletely spotted form of *obscura*, which is, however, by no means always heavily spotted in the Swiss Alps, and many Alpine specimens of which have considerably darker undersides than any specimens we have seen from le Lautaret.

#### DWARF FORM.

ab. *occidentalis*, le Chamb., "Ent.," xli., p. 202 (1908).—Aberration of  $\sigma$  and  $\varphi$ . Very dwarf undersized specimens, some not larger than *L. aegon*. Of fairly frequent occurrence (le Chamberlain).

The frequency of the occurrence of these dwarf specimens on the Cotswolds has already been referred to (p. 306). These very small specimens are not, however, confined to this locality, but occur also in Switzerland and elsewhere; on the Col de Lautaret they seem to be almost racial (var. *delphinatus*), in this latter case they are also dark, as is usual with mountain specimens.

#### ABERRATIONS OF UPPER AND UNDERSIDES.

(a) ab. *punctatissima*, n. ab. *Arion* ab., Aign., "Ann. Mus. Nat. Hung.," iv., p. 517 (1906).—In the Treitschke coll. is a  $\varphi$ , expanding 40mm., the upperside extraordinarily richly marked. On the forewings the 6 spots on the disc very strongly developed, very much elongated, in the central cell 2 black spots and one towards the inner margin; the semilunar spots on the hindwings distinct, a row of four rather large spots on the disc. On the underside of the forewings the spots on the disc, the inner and outer marginal spots, as well as the 2 spots in the central cell strongly developed, only the spots on the inner margin much reduced; on the hindwings all the spots strongly developed (Aigner-Abafi).

This specimen, described but not named by Aigner-Abafi, gives the extreme form of spotting both on the upper and underside. Similar specimens occasionally occur, and others, almost similar, but lacking in one particular or another, are fairly frequent, especially among the southern and eastern races.

( $\beta$ ) ab. *arthurus*, Melvill, "Ent. Mo. Mag.," ix., p. 263 (1873); Staud., "Ent. Mo. Mag.," ix., p. 290 (1873); (?) Lamb., "Pap. Belg.," p. 254 (1902).— $\sigma$  Alae supra violaceae, subtus cinereo-fuscae, ab *L. arione* differentes ocellis omnibus absentibus, iis circa marginem exteriorem exceptis, nigris, maculis quoque discocellularibus bene utrinque definitis; corpus caeruleo-albescens. Hab. Chamonix; one example captured June 28th, 1872. Expanse of wings about 1" by 4". The wings are violet-blue, with rather broad blackish hind-margins. The underwings

beneath are greenish at the base; fringes white; antennæ similar to those of *L. arion*. Mr. A. G. Butler states that it differs very much from all known forms of *arion*, its nearest congener. The captor describes its flight as markedly wild and irregular (Melvill).

Concerning this, Staudinger observes that such aberrations of *arion* as the above are not so very scarce on the Continent; that he has, in his own collection, four examples, all differing a little from each other; but all almost destitute of black spots on the upperside; in one specimen even the black marginal spots are absent. The disappearance of the spots, especially on the underside, occurs in all the *Lycaenids*; also the occasional appearance of black spots in species usually destitute of them; e.g., in the var. *miegii* of *Heodes virgaureae*, a number of large black spots appear on the upperside; this also occurs in *Chrysophanus hippothoë*, L. (*chryseis*, Bkh.), and in *Latorina orbitulus* from the north of Persia.

It is probably owing to this blunder of Staudinger's that the name *arthurus* has been incorrectly applied by every subsequent author, with the possible exception of Lambillion, who quotes the name without description. It is obvious from the description that the original *ab. arthurus* represents the extreme form of obsolescence, the submedian series and the basal spots being quite unrepresented on either side, not only on the underside as apparently supposed by Standing, and as taken for granted by his copyists.

(γ) *ab. parvimacula*, Aign.-Ab., "Rovart.-Lapok.," xiv., p. 214 (1907).—On the upperside only the discoidal spot distinct, while the four spots only appear in traces or not at all. On the underside of the forewing are often only two spots, on the hindwing, but for the discoidal, only three small spots (Aigner-Abafi).

This is a somewhat advanced transition towards *ab. arthurus*, and has been taken at Budapest and Szaaròn, and it is probably to this *ab.* that Mrs. Nicholl's "almost unmarked specimen" from Kostenec is to be attributed.

(δ) *ab. coalescens*, Gillm., "Soc. Ent.," xviii., p. 180 (1904); Rebel, "Berges Schmett.," 9th ed., p. 75 (1909); Courv., "Ent. Zeits.," xxiv., p. 203 (1910); Seitz, "Gr.-Schmett.," p. 321 (1910). *Lachrymosa*, Obth., "Lép. Comp.," iv., p. 325 (1910). *Arion* var., H.-Sch., "Sys. Bearb.," i. suppl., pl. cviii., figs. 519, 20 (1851); vi., p. 25 (1852); Gerh., "Mon.," pl. xxxviii., figs. 3a, b (1852).—The black spots of the upperside elongated into thick streaks, and on the underside the central row of spots is narrowly connected with the inner row of ocellated marginal spots (Gillmer).

This is a magnificent aberration figured by Herrich-Schäffer and copied by Gerhard, in which the spots of the upperside forewings are greatly elongated and those on the hindwings to a less extent. On the underside both the submedian series and the inner spots of the marginal band are produced into points towards each other, which are in some cases joined by very narrow black lines, and in others so nearly that the pale lines surrounding them join into a figure of S. It is not stated where this aberration was taken.

#### UPPERSIDE ABERRATIONS.

(a) \* *ab. telegones*, Bergs., "Nom.," iii., p. 19, pl. lxi., figs. 7, 8 (1779).—Blue as far as the middle, dull and spotted with black; on the underside dusty-

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\* Mr. Tutt had included certain other of Bergsträsser's forms (*telegonus arctophonus* and *arctophoni*) under this species, but as he had applied to me for the final decision on the matter, I have had no compunction in cutting out those which seem to me to belong to other species of the genus (G.W.).

brown. From the drawing, which is exact, the position of the eye-spots on the disc is clear (Bergsträsser).

If the drawing is exact, the description is a remarkably bad one. It is a small light blue form, with a rather narrow, well-defined black border, in which the marginal spots show distinctly darker. The discoidal spot and four small submedian spots show clearly on each of the four wings. The underside shows the normal spotting, and it must be to this that the description refers, since there are no "eye-spots" on the upperside. The fringe is white and has a somewhat wavy appearance on the upperside figure, reminding one of the hind-margin of the lower wings of ♂ *P. meleager*, but this is contradicted by the underside figure, in which the outline is quite regular. Bergsträsser calls it an aberration of *telegone*. It is a common form among the Cornish specimens, the commonest, indeed, except that there are seldom 4 spots on the upperside of the hindwings of the latter; it is also to be found in Germany.

(β) ab. *telegone*, Bergs., "Nom.," iii., p. 8, pl. lii., figs. 5, 6 (1779). *Marginatus*, le Chamb., "Ent.," xli., p. 202 (1908).—*Alis rotundatis integerrimis fuscis, corpusque versus caeruleis, nigro in antica virgulatis postica punctatis, ternis infra punctorum oculorumque arcubus* (Bergsträsser).

This is a small, broad bordered, rather dark and rather heavily-spotted form. It appears to be exactly what le Chamberlain means by *marginatus*, which he describes as an "aberration of ♂ and ♀ with all the wings possessing very broad black margins," and which he reports from the Cotswolds, adding that it is not common. It is not a rare form except in low-lying localities, and in the south, but almost (if not quite) unknown in the districts where the light southern forms are predominant.

(γ) ab. *cotswoldensis*, le Chamb., "Ent.," xli., p. 202 (1908).—Aberration of ♂ and ♀, with all the wings more or less thickly sprinkled with black scales, giving it a very dusky or melanic appearance, constituting an approach to the alpine var. *obscura* of Professor Christ. Scarce (le Chamberlain).

Unless this should be regarded as the typical form, it is one which has long required a name. We have remarked above (p. 307) that the apparent darkening of the ground colour is caused by an increasing admixture of black scales, and not by a change in the colour of the blue scales themselves. In var. *obscura* this increase of the black scales takes the form of a gradual suffusion of the wings from the dark border inwards; here, the dark scales are not sufficiently predominant to give the appearance of a black suffusion, but rather to darken, more or less, the blue of the ground-colour. Though scarce on the Cotswolds, it is a very wide spread form in northern localities, in sub-alpine districts in Central Europe, and in some of the mountain localities of the South, e.g., the Central Apennines. It is also frequently to be found in var. *cyanecula*.

(δ) ab. *aldrovandus*, de Sél.-Lingch., "Mem. Soc. Roy. Liège," p. 35 (1844); Lamb., "Cat. Lép. Belg.," fasc., iii., p. 40, fasc. xxvii., p. 428 (1907); Rebel, "Berges Schmett.," 9th ed., p. 75 (1909); Seitz, "Gr.-Schmett.," p. 321 (1910).—This *Lycaena* is, with *iolas*, the largest in Europe, for it has an expanse of more than 22 lines, the largest examples of *iolas* scarcely reach 22 lines. It differs above from *arion* in that the wings are almost as dark as in the ♀ of *erebus* (*arcas*), the last half, outside the row of black spots, not being powdered with blue. It is a ♀; the fringe is white not interrupted above, the body seems proportionately shorter and the wings more rounded. I took it at the foot of Vesuvius, on the Resina side, at the beginning of May, 1838. It is probably only a fine local variety (de Sélvs-Longchamps).

Lambillion states that this form occurs here and there with the type in Belgium. Wheeler (*in litt.*) notes an example taken by him near Iselle, July 15th, 1905, and another was taken by Mrs. Nicholl, in Bosnia.

(ε) *pallida*, le Chamb., "Ent.," xli., p. 202 (1908).—Aberration of ♂ and ♀ of a pale washed-out appearance. Not uncommon (le Chamberlain).

This is another of the Cotswold forms. There is a specimen of le Chamberlain's in the Brit. Mus. Coll. which has the costa of the hind-wings of a very washed-out appearance, but we have seen no example in which this occurs over the whole wings. If the *pallida* here described are of the same kind, the colour is undoubtedly due to a colour change in the blue scales and not to any admixture of white scales with those of the usual tint.

(ζ) var. (or ab.) *ofenia*, Tutt, "Ent. Rec.," xxi., p. 198 (1909).—Two small dull-coloured examples, the ♂ very thinly scaled with blue, the ♀ greyish, with only a tinge of blue scaling towards the basal part of the inner margin (Tutt).

Ofen Pass, August 12th, 1908. It would be interesting to know if this is the ordinary form of the species in this district, as it is very different from those we have captured in many places elsewhere.

[The following ab. has lately been described.

(η) ab. ♂ *grisea*, Courv., "Mitt. Schweiz. Ent. Gessells.," xii., pt. 2, p. 294 (1913).—A ♂, found by Gerings near Mentone, in 1911, large, with broad black border, and strongly marked with an unusually large number of spots on the upper-side, is, on this side, light grey with a very pale rosy shimmer; beneath, light yellowish grey, which is characteristic of the form *ligurica*, Wagn. (Courvoisier).

In this case also there must be a colour-change in the blue scales, comparable only to var. *amurensis*. G.W.]

(θ) ab. *basipuncta*, n. ab.—Specimens in which one or more basal spots appear on the upperside of the forewing.

The appearance of one, or two basal spots on the upperside of the forewings is by no means rare and occasionally even a third is present especially when the spots of the submedian series are large and elongated, in some cases the upper part of the double inner-marginal spot of this series coalesces with the lower basal spot, making a long black streak, almost, or quite, parallel with the inner margin. For this form we give the name

(ι) ab. *conjuncta*, n. ab.—The lowest spot but one of the discal series joined to the lower basal spot on the upperside forewing.

The Brit. Mus. coll., among others, contains a considerable number of specimens of this form; all are ♀s.

(κ) ab. *imperialis*, le Chamb., "Ent.," xli., p. 202 (1908).—Aberration of the ♀. An exceedingly fine form, generally of a brilliant blue, with the black spots on the upper surface of the anterior wings elongated into pear-shaped streaks, giving them the appearance of a diadem or crown (le Chamberlain).

This form, though apparently occurring only in the ♀ on the Cotswolds, where it is reported as being not uncommon, occurs elsewhere in the ♂ also, but more rarely. In the British Museum are magnificent specimens of both sexes from the Leach coll., unfortunately, as usual in his insects, without any indication of locality, though from all appearance it would seem probable that they came from the South of France, where le Chamberlain says that this form is common, or from the Italian Riviera. It is by no means an unusual form of the var. *obscura*, or rather of the form *obscura-major*, the

"diadem" standing out in deeper black through the dark suffusion, the basal portion of the elongated spots sometimes coming beyond it; for this we suggest the name *obscura-imperialis*, n. ab. In the var. *amurensis*, judging by the specimens in the Brit. Mus. Coll., it would seem to be racial in the ♀.

(λ) ab. *fasciata*, ♀, Gillm., "Soc. Ent.," xviii., p. 180 (1904). *Arion* ab. Brom., "Soc. Ent.," p. 74 (1893).—The black spots of the forewings on the upperside are very large and coalesce into a black band (except the two spots on the inner margin); the hind-marginal band also very broad and of very dark coloring, without any admixture of brown. The blue is a so-called "electric blue," pale and shining (Gillmer).

The particular specimen referred to was described by Bromilow as coming from the Riviera, and is obviously an ab. of the var. *ligurica*. The *fasciata* form occurs, however, in the females of other races, even in such different cases as var. *obscura* and var. *amurensis*, and is to some extent an exaggeration of ab. *imperialis*, having the spots much broader, but, on the other hand, they are generally also much squarer, not so elongated or pear-shaped. Cases, however, occur in which the spots are both broadened and elongated when the general appearance is that of a broad black band only broken by the nervures; this is the most pronounced form of *fasciata*.

(μ) ab. *alcon*, Stph., "Illus. Haust.," i., p. 88 (1828); Kirby, "Syn. Cat.," p. 374 (1871); Dale, "Hist. Brit. Butts.," p. 60 (1890). *Pseudo-alcon*, le Chamb., "Ent.," xli., p. 202 (1908).—Alis supra caeruleis (aut fuscis) immaculatis, margine fusco, subtus fusco-cinereis, serie duplici punctorum ocellatorum (Stephens).

Le Chamberlain describes his ab. *pseudo-alcon* thus:—"Aberration of the ♂ with the wings on the upper surface unspotted, and formerly erroneously considered to be the true *alcon* of Continental Europe." Both these names therefore represent the form in which the upperside lacks not only the submedian series but the discoidal spot. It is rare, but has occurred both in England and on the continent.

(ν) ab. *alconides*, Auriv., "Nord. Fjär.," p. 15 (1888); Seitz, "Gr.-Schmett.," p. 321 (1910).—Differs from the typical form by its smaller size (sometimes not more than 28mm.) duller blue and by being unspotted above (though the discoidal spot on the forewings is always present) or nearly unspotted, with a broader black border, and on the hindwings being without the round black spots; by the absence of ocellated spots within the discoidal spots on the underside of the forewings, and by the less distinct outer, and more rounded inner marginal spots on the underside of the hindwings. In all these characters it approaches *L. alcon*, and is often mistaken for that species. Transitional forms to the type are met with. Rare, among the typical specimens (Aurivillius).

This differs specially from ab. *alcon* in the presence of the discoidal spot on the upperside.

(ξ) ab. *supra-impunctata*, Obth., "Études," xx., p. 15, pl. iii., fig. 19 (1896); "Lép. Comp.," iv., p. 325 (1910). *Arion*, var. β, Stphns., "Illus. Haust.," i., p. 87 (1828); *Alcon*, Mosley, "Illus.," pt. 7, pl. i., fig. 6 (1880). *Unicolor*, Obth., "Lép. Comp.," iv., p. 325 (1910).—Remarkable for the diminution of the black dots, which in normal specimens are more developed on the upperside of the forewings (Oberthür).

The figure and description given by Oberthür are not quite in accordance with the name, since both show traces of spots on the hindwings. He explains however, here, and again in the *Lépidoptérologie Comparée*, that this was the nearest specimen to *supra-impunctata* that he possessed. Both this and Mosley's figure of ab. *alcon* differ from the *alcon* of Stephens in possessing a discoidal spot, and from *alconides*, Auriv., in



their light ground colour and in the peculiarities of the latter ab. on the underside. Stephens' description of his var.  $\beta$ , is "wings nearly immaculate above," and as he separates *alcon* from this, it is evident that the insect here intended by him must have at least the discoidals remaining, these being the last spots on the upperside to disappear. Rebel (*Berges Schmett.*, 9th ed., p. 75) gives *parvimacula*, Aign., as a synonym of this form. On this point he is incorrect, as Aigner-Abafi's aberration also shows much obsolescence on the underside. Oberthür is certainly in error in quoting *unicolor*, Horm., as a synonym for this form, since the latter represents almost the extreme opposite in the way of ground-colour, being so thickly sprinkled with black scales as to produce a very dark appearance.

(o) ab. *postero-immaculata*, n.ab.—The hindwings on the upperside are frequently without any part of the discal series of spots.

The frequency with which this form occurs led le Chamberlain (*Ent.*, xli., p. 202) into the error of supposing it to be the typical form, and consequently of naming the form in which the series, or part of it, is found *multo-maculata*. The original description, however, after speaking of black spots on the blue disc of the wings, makes no exception of the hindwings, necessarily implying that all the wings are alike in this respect. The form in which this series of spots is absent is at least as common in England as the type, and is to be found, more or less commonly, in most races of this species, probably in all except vars. *narina* and *amurensis*. In the Thibetan var. *tatsienluica* it appears to be racial in both sexes.

( $\pi$ ) ab. *caeruleomarginata*, n.ab.—Examples in which, through obsolescence of the dark margin of the hindwings, the ground colour is extended to the margin of the wings.

This aberration occurs in the lighter forms; it is, perhaps, commoner in Cornish specimens than in those from other localities. It occurs, however, in a pronounced form in some specimens of var. *amurensis*, and appears to be racial, though not so pronounced, in var. *tatsienluica*.

Two ♀s, captured in Cornwall in July, 1896, 1897, are noted and figured (*Ent.*, xxxiii., p. 102, pl. iii., figs. 6-7) with elongated spots on the forewings so far united as to form a submedian band, the hindwings with the spots almost absent. The marginal series of spots on the hindwings of normal specimens are absent, whilst the dusky margins blend into the blue. The undersides are practically typical. These we would call ab. *caeruleomarginata-fasciata*, n. ab.

#### UNDERSIDE ABERRATIONS.

(a) ab. *oolitica*, le Chamb., "Ent.," xli., p. 202 (1908).—Aberration of ♂ and ♀ of underside exhibiting fewer spots than the typical form, some of them coalescing. Rare (le Chamberlain).

This is one of the forms described by le Chamberlain from the Cotswolds. The obsolescence of spots accompanied by the coalescence of others is very rare in the *Lycænids*, though occurring in other species besides *arion*. A somewhat analogous case is to be found in those specimens of ab. *conjuncta* in which the marginal spots of the hindwing are obsolescent or entirely obsolete.

( $\beta$ ) ab. *bipuncta*, Rebel, "*Berges Schmett.*," 9th ed., p. 75 (1909).—Specimens with two basal spots on the underside of the forewings.



Rebel ascribes this name to Courvoisier, who, however, does not employ the term, regarding two basal spots on the underside of the forewing as normal in all those *Lycænids* which possess them at all. Rebel correctly holds that one only is present in typical *arion*, not merely as being more usual, but in accordance with Linné's description. Courvoisier's name *unipuncta* is, therefore, in this species, synonymic with the type. The aberration with two basal spots is common in all races and localities.

(γ) ab. *tripuncta*, Courv., "Mitt. Schweiz. Ent. Gesells.," xi., pt. 1, p. 22 (1903); Gillm., "Soc. Ent.," xviii., p. 180 (1904).—With three basal spots (Courvoisier).

Courvoisier only mentions this form for the ♂; it exists, however, in the ♀ also, and is not very rare in either sex.

(δ) *addenda*, n.ab.—Extra spots appearing near the submedian row on the underside.

With the exception of extra basal spots, both on the fore- and hindwings, the appearance of additional spots is extremely rare in this species. There is, however, an example in the Brit. Mus. Coll., from Courmayeur, with two extra spots inside the submedian band on each of the hindwings, one of those on the right wing being joined to the corresponding spot of the regular series. This is the only example we have seen, but it is probable that others exist.

(ε) ab. *subtus-maculis-extensis*, Obth., "Études," xx., p. 15, pl. iii., fig. 20 (1896); Rebel, "Berges Schmett.," 9th ed., p. 75 (1909); Obth., "Lép. Comp.," iv., p. 325 (1910).—When the spots of the underside are exaggerated (Oberthür).

This is the form which in other species we have named ab. *crassipuncta*; in the figure the spots are not very greatly enlarged, and increase of size to this extent is not uncommon, especially on the forewing, to which it is generally confined. The specimen figured was taken at Vernet-les-Bains, where this aberration is reported as occurring with some frequency. Though occurring elsewhere, it is rather characteristic of the south, and is a distinguishing mark of vars. *ligurica* and *laranda*, to some extent also of var. *arcina*. In extreme cases the spots are considerably more elongated.

(ζ) ab. *striata*, n. ab. *Arion* ab., Sheld., "Ent. Rec.," xvi., p. 100 (1904). The usual ocelli on the inferior wings are elongated into a series of streaks (Sheldon).

This example had normal spots on the right forewing, and almost obsolete ones of the left; it was taken just below the village of Simplon on July 26th, 1903. We apply the name, however, to any form possessing striated spots on the underside. They are extremely rare in this species.

(η) ab. *impuncta*, Courv., "Mitt. Schweiz. Ent. Gesells.," xi., pt. 1, p. 24 (1903); Grund, "Int. Ent. Zeits.," ii., p. 87 (1908).—Reduction of the basal spots on the forewing to nil (Courvoisier).

This is by no means a scarce aberration in either sex, and occurs even in those races which are otherwise most strongly marked, *e.g.*, in both sexes of var. *amurensis*. Slight though the aberration seems, it always gives a peculiar facies to the underside of those specimens in which it occurs.

(θ) ab. *teleius*, Bergs., "Nom.," ii., p. 73, pl. xliii., figs. 5, 6 (1779); Kirby, "Syn. Cat.," p. 374 (1871).—*Alis integerrimis fusco caeruleis maculis et punctis atris versus marginem notatis, subtus pallidius fuscis ocellorumque duplici arcu* (Bergsträsser).

This differs from *telegone* only by being larger with slightly broader margins and heavier spotting, and by the absence of a basal spot on the underside of the forewing. Possibly Courvoisier's name *ab. impuncta* should have been sunk, in this species, as a synonym of *teleius*, regarding the upperside of this form as equivalent to *telegone*. It is, however, so large and the border so broad that it rather seems to be an *impuncta* aberration of the larger alpine form which we have named *obscura-major*, and consequently we place it rather among the underside aberrations. The aberration figured by Herrich-Schäffer (*Sys. Bearb.*, i., suppl., pl. cviii., figs. 519, 20) and copied by Gerhard (*Mon.*, pl. xxxviii., figs. a, b) is rather an *impuncta* form of *telegone* than an illustration of *teleius*. Bergsträsser observes, somewhat fretfully as it seems to us, that his *teleius* has been taken for a form of *arion*; his point of view may be explained by a reference to his original figure of *arion* (*Nom.*, ii., pl. xxiv., fig. 4) which is, we believe, a mythical insect, very dark and heavily spotted, yet with the marginal spots of the hindwing edged with snowy white, and with hindwings of a shape which would suggest a hybrid between this species and *P. meleager*, in spite of a golden yellow costa to the forewings which belongs to neither.

(i) *ab. antico-obsolata*, n.ab. *Arion* var., Kill., "Ins. Graub.," p. 22 (1886).—Absence of the submedian series of spots from the underside forewing only.

Killias reports this aberration from Flims in the Grisons where it appears to recur. We have found no example of the opposite form which in other species we have called *ab. postero-obsolata*, which is not surprising, considering the rarity of examples of this species in which any part of the submedian row is absent on the underside of the hindwings.

(κ) *subtus-impunctata*, Obth., "Études," xx., p. 15, pl. iii., fig. 20 (1896); "Lép. Comp.," iv., p. 325 (1910). *Arthurus*, Gilm., "Soc. Ent.," xviii., p. 180 (1904); Krod., "Allg. Zeit. Ent.," ix., p. 52 (1904); Rebel, "Berges Schmett.," 9th ed., p. 75 (1909); Cour., "Ent. Zeits.," xxiv., p. 203 (1910); Seitz, "Gr.-Schmett.," p. 321 (1910).—Specimens in which the black spots below are obliterated (Oberthür).

The plate shows a specimen in which only the discoidals and the marginal spots remain on the underside. The specimen in question was taken at Vernet-les-Bains, but similar examples are reported from many places. That mentioned by Krodol is of the *obscura* form, and was taken at Preda, on the Albula Pass, by Franz, July 13th, 1901.

EGG-LAYING.—The ♀s insert their eggs somewhat deeply among the clusters of buds of thyme, the buds being chosen so that the hatching of the eggs and the opening of the buds should be contemporaneous. They are nearly always placed singly, only one exception being noticed (Farn). Appear to be laid on the calyces of the buds, between the heads of the flowers, a few on the stems and on the corollas of the flowers (Buckler). The ♀ appears to choose for egg-laying those thyme plants that are growing on the nests of *Formica flava* for oviposition, several ♀s being watched between July 5th and 17th, 1902, were seen to lay their eggs on thyme blossom growing out of the top of an ant-hill, and others on the thyme-blossoms of plants growing on turf-walls where ants were also in abundance; of course ♀s will lay their eggs in confinement on plants where there is certainly no connection between the plant and an ant-infested district. Eggs are noted as having been laid on June 28th, 1858, on July 6th, 8th, 1865, a few days before July 1st, 1872, June 24th, 1873, and July 6th, 22nd, 1875.

Buckler notes that, on June 16th, 1869, eggs were laid by a confined ♀, all on the calyces between the heads of flowers of *Thymus serpyllum*, but not one on either stalk, stem or leaf.

In the early morning of July 28th, 1857, in the Glogau Stadförst, Zeller observed the ♀ *arion*, as they flew slowly, occasionally sit down on the stems of *Thymus serpyllum*, and after sipping from a few flowers, bend their abdomina between the flower-stalks, on which they deposited a pale green egg, sometimes not without some apparent pains; a score or so of twigs were gathered, each with a single egg. In the afternoon they were noticed proceeding in the same manner, but the sunshine was then too hot in the open, and the oviposition was only performed under the shade of the trees.

Prideaux says that a ♀ taken *in cop.* 11 a.m., June 22nd, 1896, laid ova freely on thyme next day, between the bracts and calyx, which hatched on the 30th.

When the ♀ is egg-laying, she travels in a business-like manner from plant to plant, hardly ever rising more than a foot or two above the ground, and settling every few yards till she finds a sprig of thyme to her taste; then the wings are closed over the back, the insect turns round and round, and finally bends her body and deposits an egg between the leaflets near the end of the sprig, and is off in search of another likely plant. While this process is going on the collector can come within a few feet without disturbing her, can gather the chosen sprig as she leaves it, and follow the same insect from plant to plant (Marshall).

The eggs are generally laid singly on the largest heads of flowers, and those which are most pubescent seem to be preferred; sometimes, however, two eggs were found in a head, and in one case no fewer than six (Merrin); they were very slightly attached to the hairs of the calyx of a flower of thyme (Newman).

When the ♀ is egg-laying (usually in the hot sun) she flies from clump to clump of thyme, and usually as they rest on the flowers the more ragged-winged examples are somewhat conspicuous; she rests on a spray of thyme, lays a single little white egg near the base of one of the blossoms (often on faded flowers), moving on continuously from one clump to another (Merrin).

The egg is laid on the calyx of one of the florets of a blossom-head of thyme, and in this position is not readily seen, as usually its shallow side or periphery only is in sight when viewed from above. Two or three eggs on one flower-head are of quite common occurrence, and I have more than once found blossoms of thyme bearing as many as six eggs, although, as the larva—in confinement at least—is of cannibalistic tendencies, it is improbable that the whole of the larvæ emerging from eggs laid so closely together would arrive at maturity (Rayward).

The eggs are laid singly in the flower-heads of thyme, and whilst there are still some flowers to open. The upper part of the head seems to be preferred. The selected site is usually just below the calyx, but on the calyx or even on the teeth of the calyx is not unusual, on the corolla is rare and apparently accidental. The egg is usually so placed as to be well hidden and a head of blossom known to contain an egg may have to be explored for some time before it is found (Chapman).

Powell, writing from Entrevaux, July 17th, 1906, says:—  
“Yesterday up on Mont Gourdan I saw a ♀ *Lycaena arion* egg-laying,

and, consulting your list, I found that species down as 'wanted.' She was settling on a low-growing species of *Origanum* I think, and very careful she was about choosing a suitable head of flowers. I watched her visit about a dozen plants, but I think she laid only one egg in that time. After settling, she would walk all over the flower-head testing it with her antennæ, and if it appeared suitable, she would prod about with the end of her body, inserting it between the bracts and flower-buds, but apparently she only once found a suitable spot. Then she was still for a few seconds, straining the egg out. Immediately afterwards she flew off. Although I was certain she had laid an egg on that particular flower-head, it was some time before I discovered it down on the lower surface of a bud, and hidden by a bract so that these had to be separated with the forceps before the greenish-white egg could be seen. Many times the ♀ settled on a head of flowers and flew off again almost at once, evidently finding something wrong. Faded flower-heads did not suit her."

EGG.—Measures .52mm. in width, .32mm. in height; of a compressed globular form, sunken in centre, so much so that the micropylar area appears as a dark central spot. The entire surface is finely and beautifully reticulated by an irregular network pattern. The colour is pale bluish-white (Frohawke, July 9th, 1896). Circular in outline, flattened, covered all over, except a central depressed spot on top, with fine raised irregular reticulation, which in profile stands out strongly; colour of shell of the blue-green of a hedge-sparrow's egg; the reticulation transparent white. About thrice the bulk of the egg of *C. minima* (Hellins).

The egg is a spheroid, much depressed at the upper pole, concave at its nadir, where it was very slightly attached. The surface of the egg reticulated, the network projecting and thus communicating a cellular or honeycombed appearance to the egg; the cells are shallow, much more so than those of a honeycomb, and the surface rather more resembling that of a cow's stomach; the septa dividing the cells are extremely thin, and at every junction of septa is an elevated process almost spine-like, the array of which is very conspicuous when the egg is viewed in profile; the cells are of nearly equal size except at the north pole and its immediate vicinity, where they suddenly decrease in size, and are, in fact, exceedingly small. The colour and texture of the egg much resemble white porcelain, with the slightest possible tint of green, excepting the circular space at the pole occupied by the smaller cells where the green tint is very decided, and the limits of this darker colour are clearly defined. The empty eggshell was perfectly colourless, and exhibited a still greater resemblance to fine porcelain. A larva left the egg July 4th, 1870 (Newman).

The egg is of the cheese shape of many *Lycenid* eggs, *i.e.*, the top and bottom are flat and parallel, the sides rounded. It is 0.6mm. across at the widest part, *i.e.*, half way up, and 0.3mm. high. The actual top and bottom are 0.48mm. across. The sides, therefore, project 0.06mm. and are regularly curved, from top to bottom.

The micropylar area is 0.12mm. across and seems to be a depression only in so far that it is without the white coating of the rest of the egg. It is usually not far from circular, the example photographed is exceptionally angular. The cells forming it are somewhat irregularly disposed, but roughly conform to four or five circles of cells surrounding

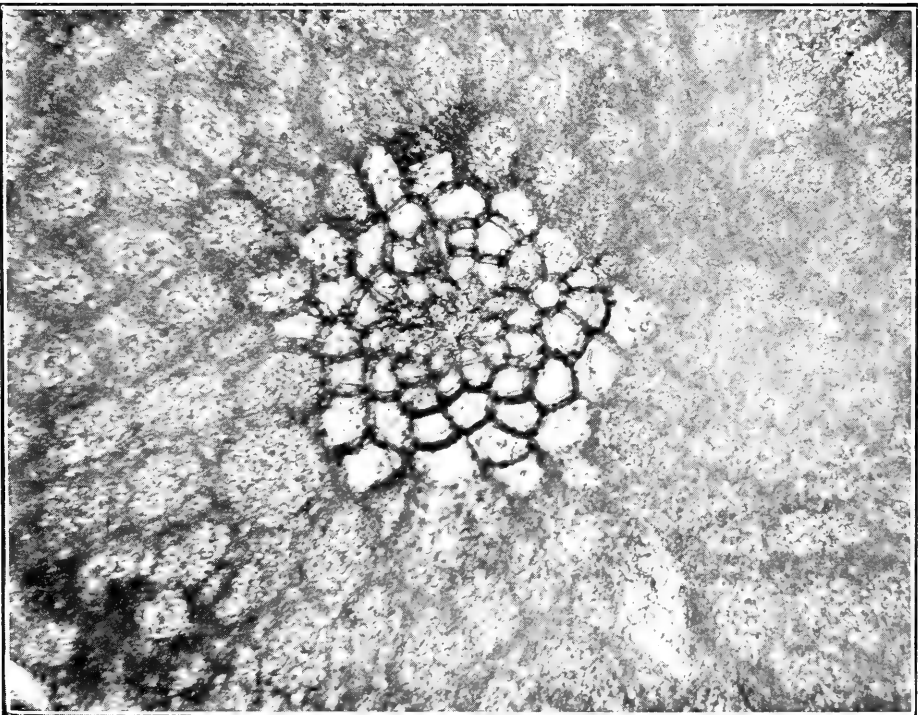
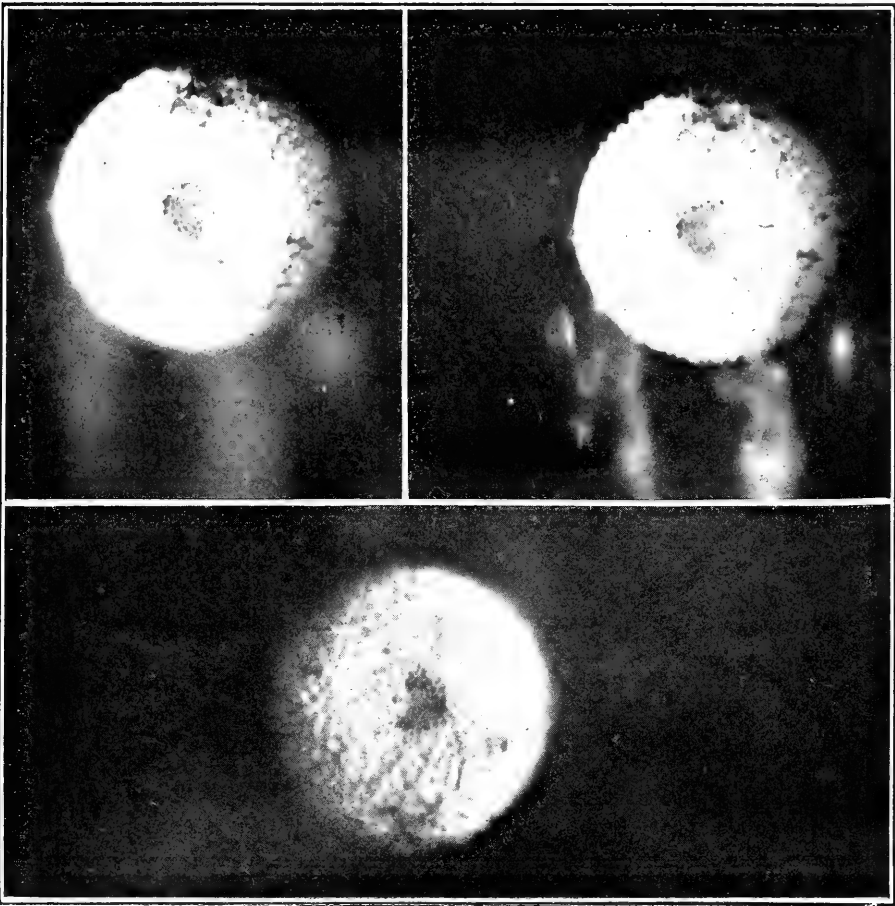


Photo. F. N. Clark.

1. EGG OF *L. ARION*,  $\times 50$ . 2. MICROPYLE,  $\times 350$ .

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a central group of four or five very small ones. These being of about 0.006mm. in diameter, the outer ones about 0.013mm. and the others graduated between these. The cells of the white or adventitious coat are a little smaller near the micropylar area, but the average size is about 0.023mm. across. They vary in form, in some places they are hexagonal, in others square, there often being three or four parallel rows of six to eight square cells. The white coating is here deeper than usual, and fairly uniform in thickness throughout, there are distinct columns at the angles of the cells, these columns are about as high as the cells are wide, their tops are flattened at a general level, but slightly notched as if each cell rib came separately to the top, or was at least there separately represented (Chapman).

The egg is figured on pl. xxxii., fig. 1, and the micropyle on the same plate, fig. 2.

The egg hatches in from six to seven days, the larva frequently taking many hours in the process of eating a sufficiently large hole in the crown to permit of its egress (Rayward).

**HABITS OF LARVA.**—The young larvæ feed most satisfactorily on the flowers of wild thyme, but are most difficult to rear in confinement, going on well till the end of July, when Buckler says they get restless, as if in search of something that he had not given them, and that his then disappeared, leading him to suggest that they might migrate at that time to another foodplant. The newly-hatched larva eats a considerable portion of the egg-shell; the extended larva is colourless, but the intestinal canal, filled with an orange-coloured substance, like the yolk of a duck's egg, is plainly perceptible (Newman). It at once enters a flower of thyme (Merrin).

A newly-hatched larva placed, on June 14th as soon as hatched, on a fresh flower-head of thyme, attached itself so closely thereto and was so similar in appearance, that it was distinguished with difficulty. It fed well until the 14th when it was observed stretched out at full length along the midrib on the upperside of a thyme-leaf, and being in the same position next day, I concluded that it was preparing for its first moult, an operation that was effected next day; it died, however, directly afterwards (Porritt).

Frohawke, on July 13th, in 1896, placed the newly-hatched larvæ on thyme blossoms, and they soon began to feed; the next day one was observed eating into the base of the calyx, so that only the last few posterior segments of the body were exposed. On the 18th more were observed feeding, and a good deal of frass was by this time adhering to the blossoms, which were more or less eaten, especially the petals; on July 22nd only two were found; in these a remarkable similarity exists between the buds of thyme blossom and the larvæ both in the colouring and the pubescence of each, so much so that it requires very close examination to discern the little larvæ, and they generally conceal themselves inside the bloom, making detection all the more difficult, but generally a small hole is eaten through the calyx, when the larva is seen with only the anal segments protruding. Frohawk gives no information about the number of moults\*, or he

\* Later he hints, without much evidence, that the larvæ of .375in. to .5625in. found in June, 1906, were still in the third stadium, as they were when .125in. long before hibernation.



appears to have judged the moult by the size of the larva; however, he notes that, after the third moult, the larvæ persistently refuse to remain on the blossoms or any other part of the plant, and appear to have a tendency to hide in the ground. Nothing more, however, was seen of these larvæ (*Ent.*, xxxii., 104-106). In 1902, Frohawk obtained further larvæ, and, on August 8th, states that he had larvæ in four different stages, some only just hatched, one over the third moult, others fixed for third moult, a large number after the first and second moults, and adds that after each moult, they ate part, and in some cases nearly all, the cast skins. He further noted that on August 11th, many having passed their third moult, when they cease feeding on thyme (one supposes simply because they are ready to hibernate), he experimented on them and ants, thinking they might feed on the larvæ or pupæ of the latter (though why he should think this, because the larvæ left off, as do so many "blue" larvæ at this time for hibernation, is not stated); it is, therefore, the more remarkable, that one larva, supplied with an ant's cocoon with one end removed, at once began eating it, feeding on the jelly-like substance of the pupa as well as the cocoon, which it ate in the same manner as it would a leaf, by biting the edge; it fed for several minutes, and he states that he thought he had found the right food for their subsequent stages, but this proved not to be the case; one wonders, indeed, what other food they could want during hibernation. By accident, Frohawk then found that the larvæ were myrmecophilous, for putting a larva in another box with four ants of *Formica flava*, they ran to it, waving their antennæ over and upon it, apparently smelt and licked it, and seemed particularly attracted to the dorsum of the tenth segment, and he then describes, as happening in *L. arion*, the symbiotic connection long before discovered by Edwards, de Nicéville, etc., with larvæ of *Celastrina argiolus*, and many other species. He notes that the larvæ appear to be perfectly at home with the ants, neither molesting the other; and there appears to be no attempt at cannibalism at this time, although, on one occasion, July 29th, 1902, two small larvæ were observed rolling together under the thyme-blossom, the smaller one of which had seized the larger with its jaws, which were buried in its side apparently sucking it, and this cannibalistic habit he considers was the possible cause of so many mysterious disappearances. Frohawk, in some inexplicable manner, considered that *L. arion* larvæ wanted feeding during the winter, and he mysteriously states that he discovered, after trying over three dozen different plants, a certain food upon which he induced them to feed for many weeks, during which time they slowly grew from  $\frac{1}{8}$  to  $\frac{1}{4}$  in. in length. One isn't surprised to find that this interference with the hibernating larvæ, and the unnecessary ultra-care, killed all the larvæ off, although they are said to have doubled in length under the treatment! At last, Rayward and Frohawk, in June, 1906, discovered the full-grown larva in one of its well-known haunts in Cornwall, hiding in an ant's nest. Four were turned out of the same small portion of an ant's nest, only just beneath the surface among the roots of the little plants of grass growing with the wild thyme, the soil surrounding them being loose and friable, worked up by the ants; in company with the larvæ of *L. arion* were ants and their larvæ and pupæ, but a great deal of time spent in searching other nests was attended by no further success.



Frohawke hints at the blossom and younger shoots of furze being the foodplant, though why not thyme is difficult to see, and again broaches the suggestion that the larva changes its food, although there is no evidence whatever of the fact, and states (*Ent.*, xxxix., p. 147) that he thinks that "it is tendered by the ants (*Lasius flavus*), in the same way as their own larvæ are fed from mouth to mouth with food the ants disgorge." There is no more evidence that this is so, than there is for the supposition that they want feeding in the winter, or wish to change their food when they simply leave the foodplant for hibernation. Rothschild refers (*op. cit.*, p. 172) to Frohawk's mysterious "food," and his hints that the larvæ do not hibernate when they leave the thyme, but require feeding, so that the creation of difficulties in the life-history of this species has not struck us alone.

[The whole of the foregoing section, including the footnote, is given word for word as written by Tutt. As it is almost the only section which he left ready for publication, I have not felt at liberty to change it in any way, though I feel quite confident that, had he lived, it would have been considerably modified. Much information is available now which was not published when the above was written, and further, Mr. Frohawk's view that the hibernating stage of the larva is its last has been fully borne out by Dr. Chapman. It will perhaps be permissible for me at this stage to express my own very decided view that everything points to the probability that the larva is, in its last instar, carnivorous. It is now well-known that many Lycænid larvæ are so, and that these belong to the Lycænid, as opposed to the Plebeiid, division of the "blues," while all known Ruralids have some tendency, in confinement, towards cannibalism, which implies some degree of carnivorous instinct. The Hon. N. C. Rothschild argued (*Ent. Rec.*, xxii., p. 40) that "it is absurd to assume that any portion of the larval stage is really associated with ants, as, were this the case, the numerous nests that have been submitted to rigid and minute examination must have yielded examples of the larva, and none have been found." "Mr. Frohawk himself," he adds, "is, we believe, convinced that his original suspicions in this direction are really unfounded." Of course there is essentially something "absurd" about all "assumptions," including the assumption that if the larvæ of *L. arion* had existed in ants' nests they must have been found, but apart from this, the obvious answer to Mr. Rothschild's contention is that both the full-fed larvæ and the pupæ have been found in ants' nests, and have been found nowhere else. Mr. Frohawk's latest publication on the subject (*Ent.*, xlv., p. 321) makes no mention of the fact that he has actually seen the larva of *L. arion* eating both the pupa and the cocoon of an ant, and apparently surrenders the position that it is carnivorous. His reasons for doing so are however utterly insufficient, and indeed appear to me to tell rather in favour of the hypothesis. It would seem probable that what the larvæ placed in Mr. Donisthorpe's observation nests were searching for was darkness, since, if they hibernate in the nests of *Formica flava*, itself a hibernating species, it is at least probable that they hibernate also, and in that case experiments in observation nests are practically useless, for either the larvæ must fail to find darkness and retirement, or they must cease to be under observation. Failing to find a suitable place for hibernation they must feed or die, and if the carnivorous instinct does not awake in them till after hibernation, there is nothing

surprising in their readily eating green peas or the soft beans of the scarlet runner, when we remember that many species feed on the young seeds of *Collutea arborescens* and other pod-bearing plants throughout their larval life. It must also be remembered that of the larvæ fed by Mr. Frohawk in this manner, not one survived, which fact, though far from being a proof, is an indication that there was something unnatural about the time or manner of their feeding, or about the actual diet. It may reasonably be objected that some of the Lycænid larvæ which are known to be parasitic on ants and at the same time carnivorous, such as *Euliphyra mirifica*, are efficiently protected by a hard chitinous skin, the flange of which projects so far over at the sides as entirely to guard the ventral portions of the larvæ, and that they thus escape destruction; and it may be doubted whether the ants would tolerate the presence of an unprotected parasitical carnivorous insect in their nests. To this it may be replied: first, that ants do tolerate in their nests other insects which prey upon their larvæ and pupæ; secondly, that the larva of *L. arion* has a well-developed honey-gland, which, though not strictly speaking protective, is very likely to make its presence at least tolerated, and probably even welcome, in the nest; thirdly, that even if the larva is carnivorous, it does not necessarily follow that the larvæ or pupæ of the ants form its pabulum, as it may feed upon one or more of the other insects that inhabit ants' nests, though this is perhaps less likely, and there is certainly so far no proof, or even indication, of it; and fourthly, that it is not certain that the ants never do, after hybernation, resent the intrusion of the stranger, since the conduct of the ants towards the larvæ has only been tested before that period, at a time when, if my hypothesis be correct, the carnivorous instinct is still latent. Indeed, either of the two last-mentioned proclivities would help to account for the usually very sporadic appearance of the insect throughout its range, and if the larvæ feed on any other myrmecophilous insect, the survival of the species in any locality would be dependent on the existence of that particular insect in the identical nests into which the *arion* larvæ found their way. Mr. Frohawk has, with great fairness, pointed out in his last communication to the *Entomologist* (*loc. cit.*, p. 322) that the small size of the larvæ when they leave off feeding, and their close colour-resemblance to their surroundings may account for some of them having been overlooked in ants' nests before hybernation, and the fact that all the pupæ found by Mr. Percy Richards (*Ent.*, xli., p. 183) were not only under stones in the ant's nest, but were also enclosed in earthen cells of the size of the pupæ, may readily account for the previous lack of success in finding the latter. Mr. Richards suggests that these cells may have been made by the ants; it is possible, and there is a way of accounting for it which may not be too far-fetched; possibly the larvæ, hitherto tolerated, or welcomed, on account of their honey-gland, may instinctively attempt to get out of danger from the ants before making the pupal change, either by making their way close to the surface, as in the case of those found by Mr. Frohawk and Mr. Rayward, or by hiding under stones, as in the case of those found by Mr. Richards. In the latter event, they may escape detection during the short time the pupal shell requires for hardening, and the ants, regarding the now useless pupa as an encumbrance may enclose it in the earthen cell, finding it too hard to

devour and too heavy to remove from the nest, or the larva itself may make the cell as a protection; the presence or absence of silk in the formation of the cell would serve to decide this question. In either case such pupæ as are discovered by the ants immediately after their change, while still soft, would very probably be devoured by them, (the larva, even when preparing for the change, being no doubt too familiar an object to be frequently attacked), and this fact may perhaps account for the destruction of a number of pupæ. It does not of course follow that the larvæ are necessarily carnivorous because they live in ants' nests, but it seems to me that it is the only theory hitherto advanced which fits the facts so far as they are yet known; further facts may of course come to light which will prove this to be a mistaken hypothesis, but that ants' nests, and particularly those of *F. flava*, are the normal place of abode of the larvæ of *arion* during the whole of their final instar appears to me to be almost beyond dispute.—G. WHEELER.]

The larva when newly hatched is almost colourless, and if it may be said of the egg that it is difficult to see, the larva when at rest may certainly be described as almost invisible, so closely does it assimilate in coloration to the white base of the thyme blossom on which it feeds. As it grows, however, it becomes more conspicuous, and perhaps less retiring in its habits, for, when rearing it in confinement, I have frequently found it crawling or resting exposed on the stem of the flower-head, and sometimes even on a leaf of the growing plant (Rayward, *in litt.*).

The larva in at least its first two instars and usually the third, lives in the interior of the flowers eating the pistil, germen, and often portions of the stamens and corolla. Its method of entry and leaving is by a hole in the calyx, though when older it will attack the flower from above and will even eat portions of leaves (Chapman).

THE HONEY-GLAND OF THE LARVA OF LYCÆNA ARION. SYMBIOSIS BETWEEN THE LARVA *L. ARION* AND *FORMICA FLAVA*.—The small, elongated, transverse honey-gland is on the dorsum of the 7th abdominal segment. It is formed of glassy-white pyriform processes varying in size, some extremely minute, those bordering the edges of the gland furnished with excessively small, white bristles, each process bearing four or five; these are in the form of a fan with diverging points, and all are directed towards the central aperture, the whole forming a fringe surrounding the gland; obviously for the purpose of holding the bead of liquid in place, and probably also to serve as a protection to this apparently sensitive organ. The gland was first noticed in the larva of this species by Frohawk, who, on August 11th, 1902, placed a living larva of *arion* with four individuals of *Formica flava*, which ran to it, waving their antennæ over and upon it, apparently smelling and licking it, being particularly attracted to the dorsum of the 7th abdominal segment. First one and then another of the ants would run over the larva, and then stop to lick this part of the back; a big bead of moisture was then observed and one of the ants touched it with its mouth, when the bead instantly disappeared. He then detected on the dorsum of the 7th abdominal segment, the small elongated transverse gland which attracted them. Another larva was examined under the microscope whilst feeding; and it was noticed that during the operation the gland kept throbbing, so the ants were placed close to it, and

some ran over it. He says that directly an ant's foot touched the gland or the skin in its near neighbourhood, it throbbed more violently, swelled up, and ejected a globule of clear white liquid, which was instantly licked up by an ant; in a few seconds a foot again touched the gland and another bead of liquid oozed out, which was at once licked up by an ant. He observes that the larva took no notice of the ants running over it and around it whilst it kept feeding, the gland being apparently only so extremely sensitive to the touch of an ant's foot; touching with a sable-hair brush had no result, the larva only winced and contracted, nor could any artificial imitation produce the secretion, but directly an ant's foot, or the claws of the foot touched it, a bead would appear, and at once be imbibed by the ants. Although the larva was kept in a box with numerous ants, both workers and winged ♀ s\* together with their pupæ, the ants all acted precisely similarly, not one attempted to bite the larva, but as soon as they touched it they slowly closed their jaws, and waved their antennæ over and upon it (*Entom.*, xxxvi., pp. 59-60).

In the spring after hybernation, and probably also during the winter, it sometimes, at least, lives in association with ants, and on June 3rd, 1906, four larvæ were found in one nest of an ant, *Formica flava*, by Mr. F. W. Frohawk and myself, in north Cornwall, one being quite fully grown, and the other well advanced in the last instar. All were near but beneath the surface at the crown of the ant hill, and were living among a large colony of ant larvæ and pupæ, with which they were apparently on perfectly friendly terms.

In colour they very closely resembled the ant larvæ, being of the same pale semi-transparent white; there was traceable, however, a slight shade of ochreous, which was not seen in the ant larvæ, and this became rather more pronounced after the larvæ had been removed from the nest for a few hours.

The ants' nest in which they were found was situated on the sheltered and sunny side of a low gorse bush, the top of the nest crown being some three or four inches above the surrounding surface of the ground, and the entire surface of the hillock was overgrown with thyme and short grass.

Although a very large number of nests were opened by Mr. Frohawk and myself, only in this one instance were *arion* larvæ found, and as the locality in which our search was conducted is the headquarters of the species, which is usually plentiful there, it appears probable that the large ant hills are not the only, or indeed the chief, home of the larvæ. The whole hillside on which *arion* occurs in this locality is so thickly infested with ants, however, that one can scarcely turn over a stone or stick without disclosing a large or small colony, and if the *arion* larva were wholly dependent upon the ants for its food after its last moult in the autumn, it would rarely have to crawl more than a few inches from the flowers of the thyme plant upon which it had until then fed, before coming within reach of the new source of supply.

Assuming that the larva is so dependent upon the ants, and lives for a period of its growth amongst their larvæ and pupæ, it is never-

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\* ? Winged ♀ s in August.—(J.W.T.)





*Photo, F. N. Clark.*

LARVA OF *L. ARION*. SKIN OF 1ST INSTAR,  $\times 64$ .

*A Natural History of the British Butterflies, etc., 1914.*

(To face p. 335.)

theless certain that, when fully grown and ready for pupation, it sometimes if not always leaves the nest or shelter within which it has been concealed, and seeks a secluded and convenient position at the roots of the surrounding herbage in which to undergo its change, a position very similar to that chosen by its allies *Agriades coridon* and *A. thetis*.

The discovery of a freshly emerged ♀ *arion* imago in the early morning—8 a.m.—of July 12th, 1905, by Mr. F. W. Frohawk and myself, stimulated our already keen desire to learn something of the pupa, and as the imago, when found, was hanging about a foot from the surface of the ground to the spines of a low bush of gorse, through which was growing a tangled mass of heather, thyme, and coarse grass, the first step towards success, obviously, was to closely examine, and remove piece by piece and stem by stem, this tangled growth, it appearing probable that the empty pupa case would be found attached to one of the twigs or stems.

The whole bush, covering perhaps about four feet by three, was in this way gradually removed, but without success, and when the last piece of heather had been cut away, the mystery appeared to be as far from solution as ever.

We were, however, determined to leave no room for failure, and therefore proceeded to excavate the ground we had cleared, and to remove the gorse, heather and grass, root by root.

For some time even this drastic proceeding seemed as little likely to prove successful as had been the earlier work, but at length patience brought its usual reward, and our pleasure may be imagined when, on carefully pulling away a small portion of the root of a tussock of coarse grass, a living pupa was disclosed, evidently *Lycænid* in shape, and beyond suspicion that of *arion*.

This was a surprise indeed; we were looking for, and hoping to find, an empty pupa case, and here was brought to light instead something even more welcome and conclusive.

Needless to say our energies were redoubled, and to our great pleasure success quickly followed upon success, for within three inches of the spot which had been occupied by the living pupa, and snugly ensconced in the roots of the same tuft of grass, was found the empty case of the ♀ whose consideration in emerging just as our eager steps were scouring the rough hillside, deserves our lasting gratitude.

Both pupa and empty case were near, but certainly below, the surface of the ground, and, so far as could be seen, neither was in any way attached to the earth or roots by girth, cocoon, or silken pad.

From the living pupa a ♂ imago emerged on the 16th of July, 1905, as recorded by Mr. Frohawk in the *Entomologist* of August in that year, p. 194 (Rayward, *in litt.*).

ONTOGENY OF LARVA.—*First instar*; When newly-hatched exceedingly small; only .8mm. in length; rather stout in proportion; the segmental incisions deeply defined; a longitudinal dorsal furrow; head showing olive-black; on the prothorax a large dorsal dark-coloured disc; a smaller one on anal segment; colour of body pale ochreous-yellow, tinged with greenish; on the dorsal surface longitudinal rows of glassy white serrated hairs placed in two pairs on either side of each segment above spiracles, all have pedestal-like bases of olive colour; the dorsal row (i. and ii.) all curving backwards; the anterior one (i.) on each side much the longest; the subdorsal pair

(iii.) are both short, the anterior one curving forwards, the posterior one backwards; below the spiracle, which is black, are three brownish-coloured serrated hairs (iv., v. and vi.) placed in triangular form; all projecting laterally, and all with dark bases; the central one very long; below these, on the first lateral lobe of each segment, a simple white hair (vi.); two other very similar ones on the base of each proleg (vii.). The whole surface of body densely sprinkled with blackish points, giving it a rough appearance and adding to the appearance of the depth of the segmental incisions. The legs and prolegs similar in colour to the body (Frohawke). Head black; body colourless, but the intestinal canal, filled with an orange-coloured substance like the yoke of a duck's egg, plainly perceptible. Each segment of the body emits a few scattered hairs; these are particularly observable near the anal extremity (Newman). When full-fed in this instar pinkish brown (Buckler).

*Second instar*: About .16 in. in length, stout, tapering towards head, which is much smaller than the prothorax. General colour dirty pink. Head brown and shining. Behind the head is a large almost plate-like dull black mark, from which extends the rather broad, conspicuous, rust-coloured dorsal line. Body sparingly clothed with light brown hairs (Porritt). .083 ins. long; the first and last segments are flattened, projecting and rounded, overlapping the head (which is withdrawn while at rest), and the anal claspers. The body is much arched, having a medio-dorsal ridge considerably elevated; the sides are flattened and sloping to a lateral ridge; the under surface is also flattened, the ground colour is of a pearly white, thickly studded with very minute blackish points; and scattered over the whole surface are a number of bristles, varying in length, all having bulbous dark shining brown bases; the longest are situated on the dorsal and lateral regions; the spiracles are shining dark brown; the segments are beautifully marked with purplish pink, forming longitudinal stripes, the most conspicuous being the medio-dorsal and lateral stripes; the three other stripes, two above and one below the spiracles, are made up of oblique markings. The head and prolegs are brown, and the claspers whitish (July 22nd, 1896).

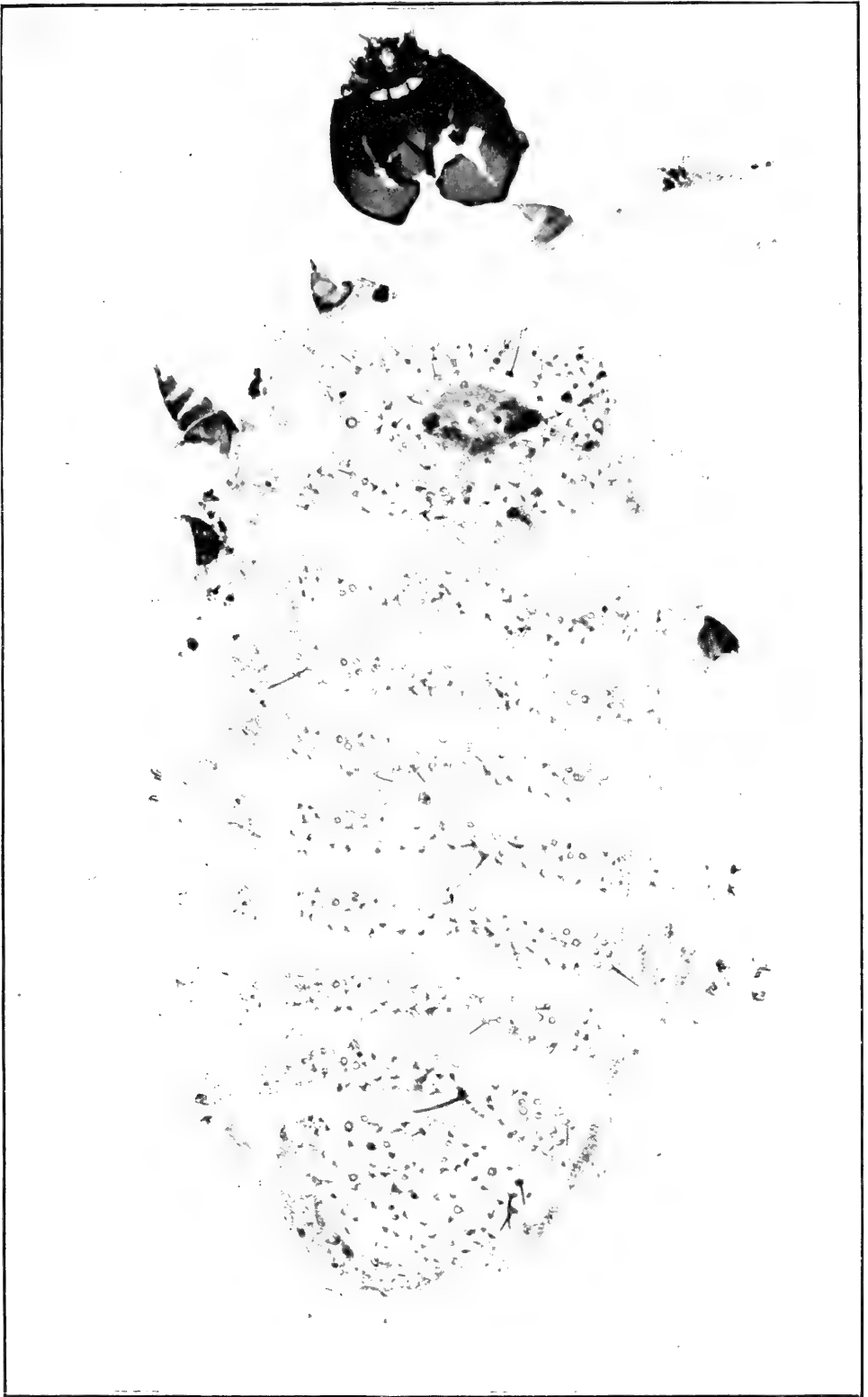
?*Third instar*\*: .125 in. long, similar in colouring, pattern, and structure, excepting that it is brighter, and the hairs a good deal longer, and the head is shining black. (Another larva July 22nd, 1896).

?*Fourth instar* (the large larva above moulted July 26th). Still measured .125 in. when fully extended (20 hours after moulting). The general colour now more uniformly ochreous-pink and duller; the second and third segments are humped; the first segment is sloping to the front, sunken in the middle and rounded, overlapping the head, and it has a large black oval patch in the centre: the three posterior segments are also compressed and sunken; each segment is humped sub-dorsally, forming a deep longitudinal medio-dorsal furrow, the sides are concave, and the lateral ridge projecting and overlapping the entire length, hiding from view the legs and claspers; there are four

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\* As Mr. Frohawk only notes looking at the larvæ (which hatched on July 10th) on July 13th, 14th, 18th, 22nd, 1896, and apparently made no observation on the moulting; it appears probable that these were assumed to be in different stadia merely on account of the difference in size. Porritt gives the length in second instar as  $\frac{1}{8}$  in.





*Photo. F. N. Clark.*

LARVA OF *L. ARION*. SKIN IN 2ND INSTAR,  $\times 50$ .

*A Natural History of the British Butterflies, etc., 1914.*

*(To face p. 336.)*





Photo. F. N. Clark.

LARVA OF *L. ARION*, 3RD INSTAR, WITH HEAD OF PREVIOUS INSTAR ABOVE,  $\times 25$ .

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longitudinal rows of long curved hairs, one row being sub-dorsal, and one lateral; each row is composed of a single hair on each segment from the fourth to the ninth inclusive, on which segment the sub-dorsal series terminates; the first three segments have each a set of three sub-dorsal hairs, those on the first segment curving forwards: the lateral series are likewise formed of one on each segment, and all directed laterally and surrounding the extremities of the larva; the hairs have the bases of remarkable formation, resembling glass-like pedestals with fluted sides. The entire upper surface of the body is densely studded with extremely minute pyriform glassy processes; the under surface is equally as densely clothed with very short stoutish hairs. The head is ochreous with dark brown markings in front; the prolegs dusky, and the claspers are unicolorous with the under surface (July 27th, 1896). *Full-grown* (after hibernation)\*; .583in. long. Head extremely small, out of all proportion with size of larva. The small black dorsal prothoracic disc now a mere speck.

The head is set on a very flexible retractile neck which can be readily protruded beyond the first segment while the larva is in motion; but when resting, the head is completely hidden and withdrawn into the ventral surface of the segment.

**DORSAL VIEW.**—Both anterior and posterior segments are rounded, the body gradually increasing in width to the 10th segment. The segmental divisions are deeply cut, each segment being laterally convexed. **SIDE VIEW.**—First anterior and last three posterior segments somewhat flattened dorsally and projecting laterally; second to ninth segments humped dorsally; the medio-dorsal furrow usual to *Lycæna* larvæ is, in *arion*, only indicated on the posterior half of each segment; the sides are sloping and convoluted to the spiracles; the lateral ridge is dilated, swollen and prominent, but rounded, and the ventral surface is full and of a bulbous character; the rather small feet are well provided with strongly-curved hooks. All other structural details are as in the description given of the larva after the third moult, in vol. xxxii., p. 105. But on examining the full-grown specimen, I find that all the long dorsal hairs have been broken or worn off short, leaving only a series of basal stumps. The colour is a pale creamy ochreous, with a pinkish lilac tinge along the lateral ridge, and surrounding both the first and last segments. When first found, the entire skin had a shining distended appearance, as if too tight for its obese proportions (Frohawke).

The following is Chapman's account of the larva and its ontogeny as worked out by him, and illustrated by his plates. In the four instars of the larva, the heads in each stage seem to follow the usual law of increase in size, the transverse diameter increases at each moult by the same ratio, in this case about that of three to four. The actual width of the heads, from a number of measurements at each stage, as accurately as slightly distorted specimens (in some cases) allowed, were first stage 0.30mm., second 0.40mm., third 0.54mm., fourth 0.72mm. This diameter of head in the full-grown larva, of about three-quarters of a millimetre, is remarkable. *Arion* is our largest British blue and this diameter, 0.72mm., may be compared with that in *medon* 1.0mm.,

\* Four larvæ found June 3rd, 1906, *i.e.*, after hibernation, and all apparently in last instar varied in length from .375in. to .5625in. in length (*Ent.*, xxxix., p. 146).

*icarus* 1.2mm., *coridon* 1.5mm., *argus* (*aegon*) 1.0mm., and even *minimus* 0.84mm. Admitting that my measurements may not be accurate, these here given, made in a similar way, are certainly comparable.

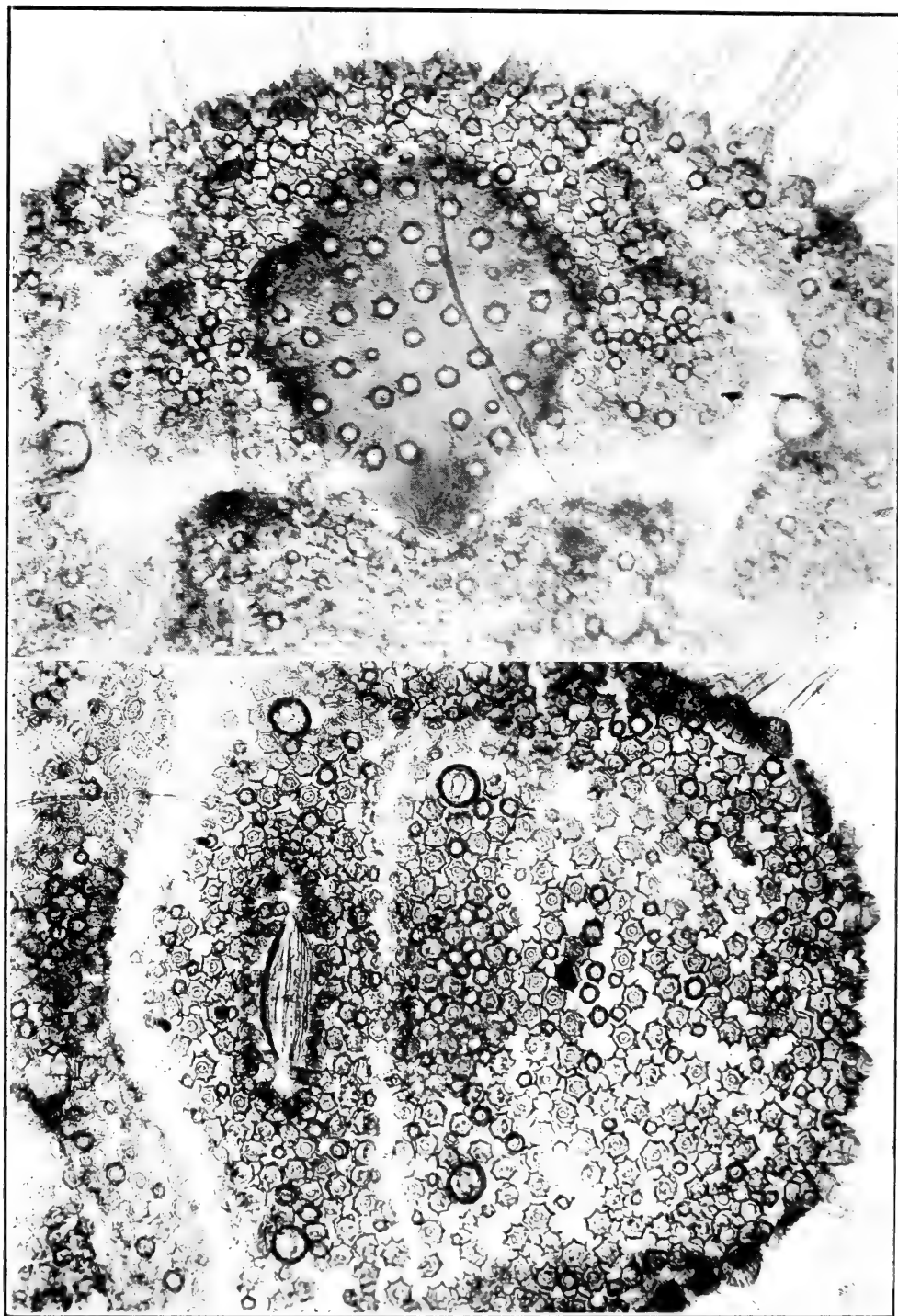
This small size of head implies that the feeding of the larva in this stage is in some unusual manner, and also that that manner, whatever it is, does not require greater power and energy on the part of the larva, than is usual, but probably much less. It lends, therefore, some support to the idea that throughout this stage the larva is in some way supported by, or at the expense of the ants and not in the ordinary way of eating vegetable tissues. The eating done in this stage in the autumn seems to be negligible, yet the jaws are of typical form, not modified in a predacious direction, as if it fed on ant larvæ, nor on the other hand degenerated as if the larva was actually fed by the ants. It seems to emphasise without in any way clearing up the mystery attending this period of the larval life.

When hatched the larva is of pale greyish colour, it soon becomes reddish and, except in the matter of size, the following description taken from a second stage larva would apply to each stage: "Short and thick and of nearly uniform size, from end to end 2.3mm. long. Flesh colour with darker, almost red markings, head black, prothoracic plate grey and black; seen laterally, however, there is a regular tapering from third abdominal segment to posterior extremity. The red markings are a broad dorsal band, an upper very fine and a lower broader oblique line, then red above the nearly white lateral flange, below which there is again a darker, followed by a pale band. The full-grown larva (before hibernation) is only 5 or 6mm. long.

When the larva of *arion* in its fourth (last) instar disappears for hibernation it is very small, suggesting that it is in the same early instar in which so many other larvæ of blues enter into hibernation; these others have, however, further instars to assume after they come out to feed in the spring. *L. arion* larvæ, when found in the spring as a large fat larva, of larger size than a full-grown larva of *icarus* or *coridon*, is nevertheless still in the same instar as it was in on its autumnal disappearance. The proof of this is to be found in a comparison of the head, legs, prothoracic plate, and hairs and their bases of the two larvæ. The only difference is that the hair bases on the autumnal larvæ are most closely packed together, more so than is so usually the case in larvæ of blues immediately after a moult. On the spring larva the hair bases are widely apart, the skin between them being well-developed, or extended; in the autumnal larva there was no skin visible, so closely are the hair bases packed together.

These facts are demonstrated on pl. xli., figs. 1 and 2, which show the heads of the autumnal and spring larvæ at the same magnification, viz.,  $\times 50$ . 1. the autumn larvæ; 2. the full-grown larva (somewhat distorted and damaged). Pl. xxxvii., the prothoracic plates: 1. of the autumn, 2. of the full-grown larva  $\times 100$ . In fig. 1 the hair-bases are so closely packed that the whole prothorax comes into the picture. In fig. 2, the full-grown larva, there are comparatively few hair bases, the greater part of the area being the intermediate skin. I ought to say here, by parenthesis, that the full-grown larva I had was, from the point of view of mounting on a microscopic slide, in a very dirty condition, and my efforts to clean it left it a good deal damaged, and still





*Photo. F. N. Clark.*

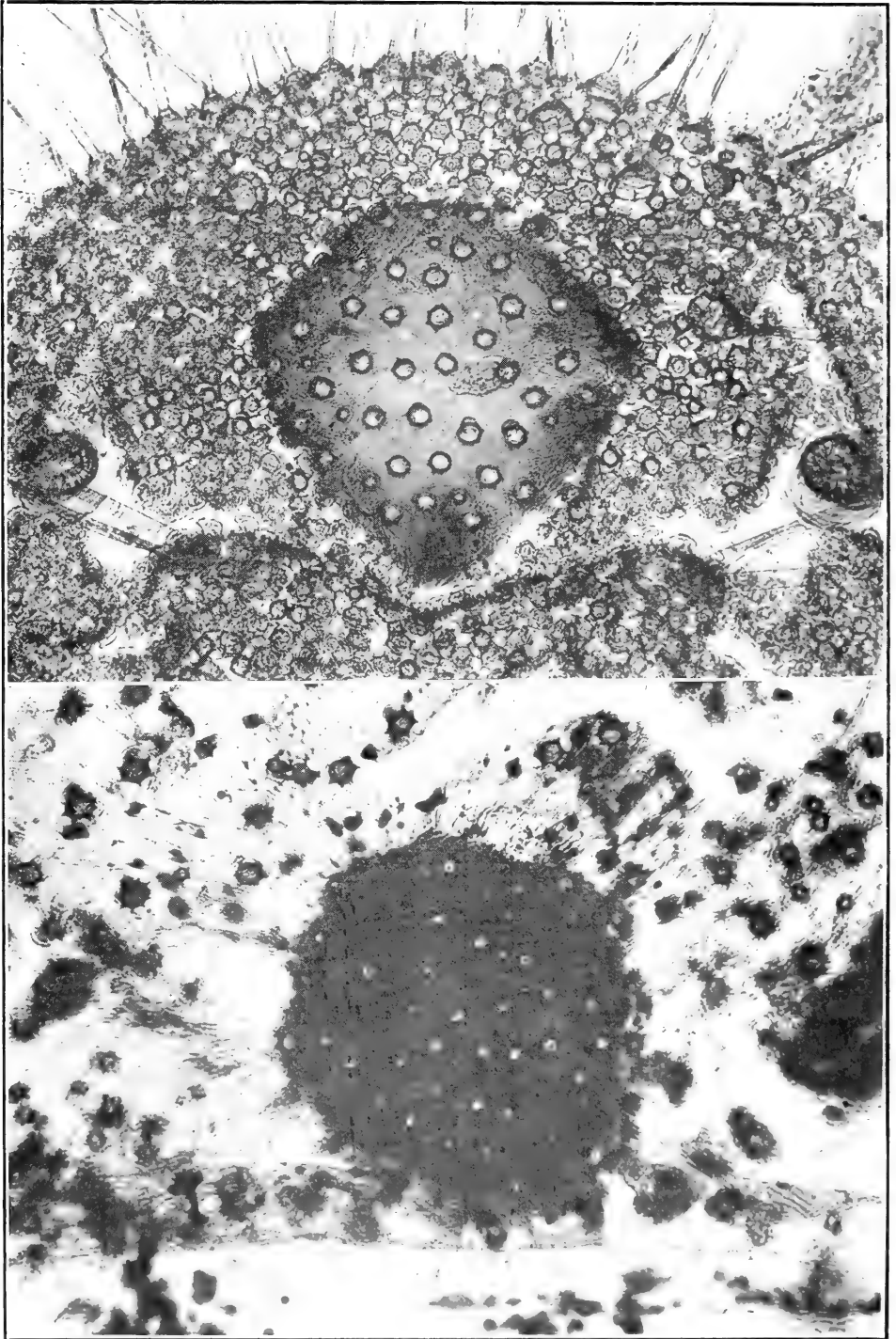
**L. ARION. LARVA BEFORE HIBERNATION. PROTHORAX AND LAST FOUR ABDOMINAL SEGMENTS.**

*A Natural History of the British Butterflies, etc., 1914.*

*(To face p. 339.)*







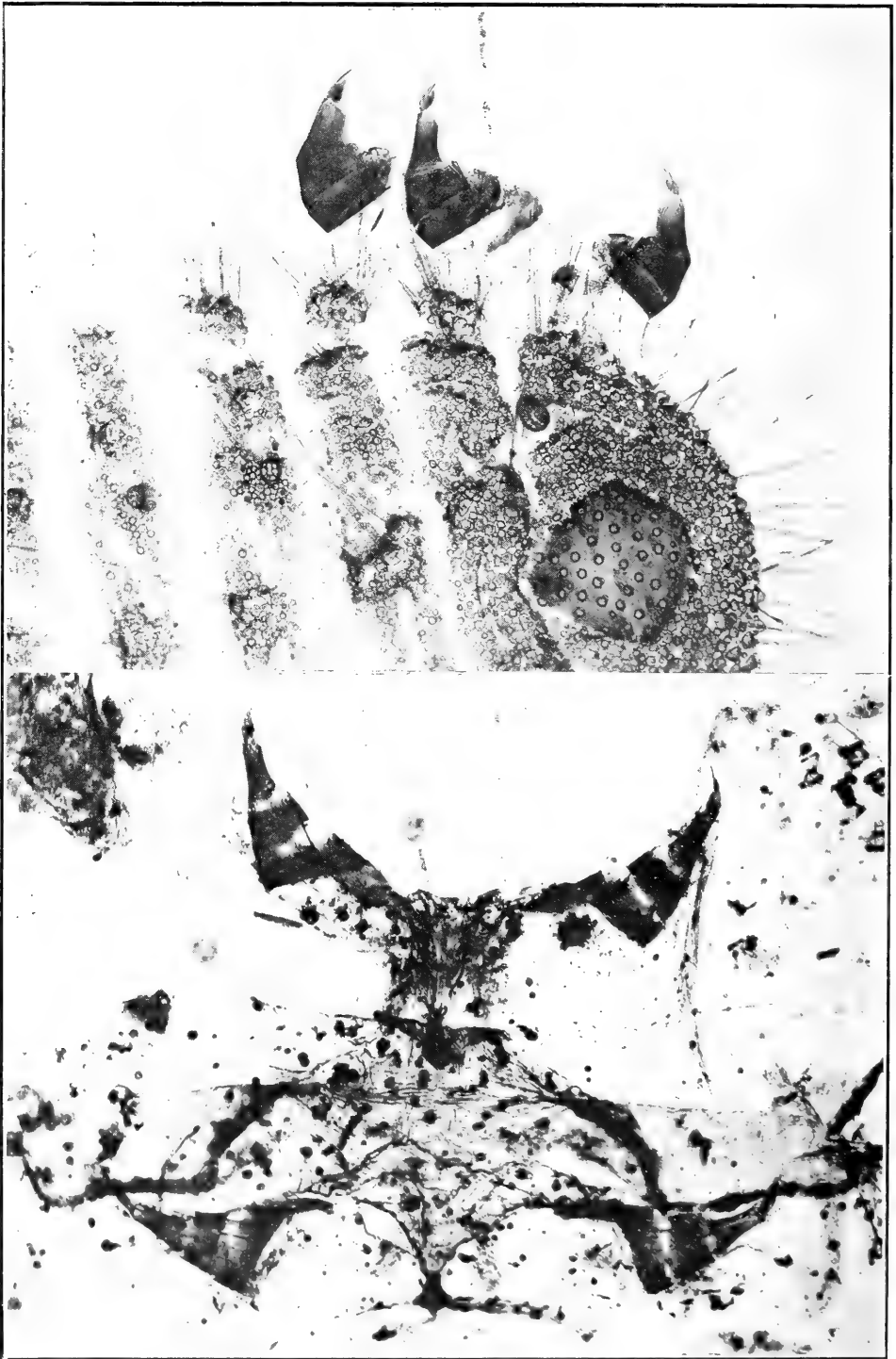
*Photo. F. N. Clark.*

LARVA OF *L. ARION*. PROTHORACIC PLATE BEFORE AND AFTER HIBERNATION,  $\times 100$ .  
LATTER IS TURNED SOME  $30^\circ$  TO THE LEFT.

*A Natural History of the British Butterflies, etc., 1914.*

*(To face p. 339.)*





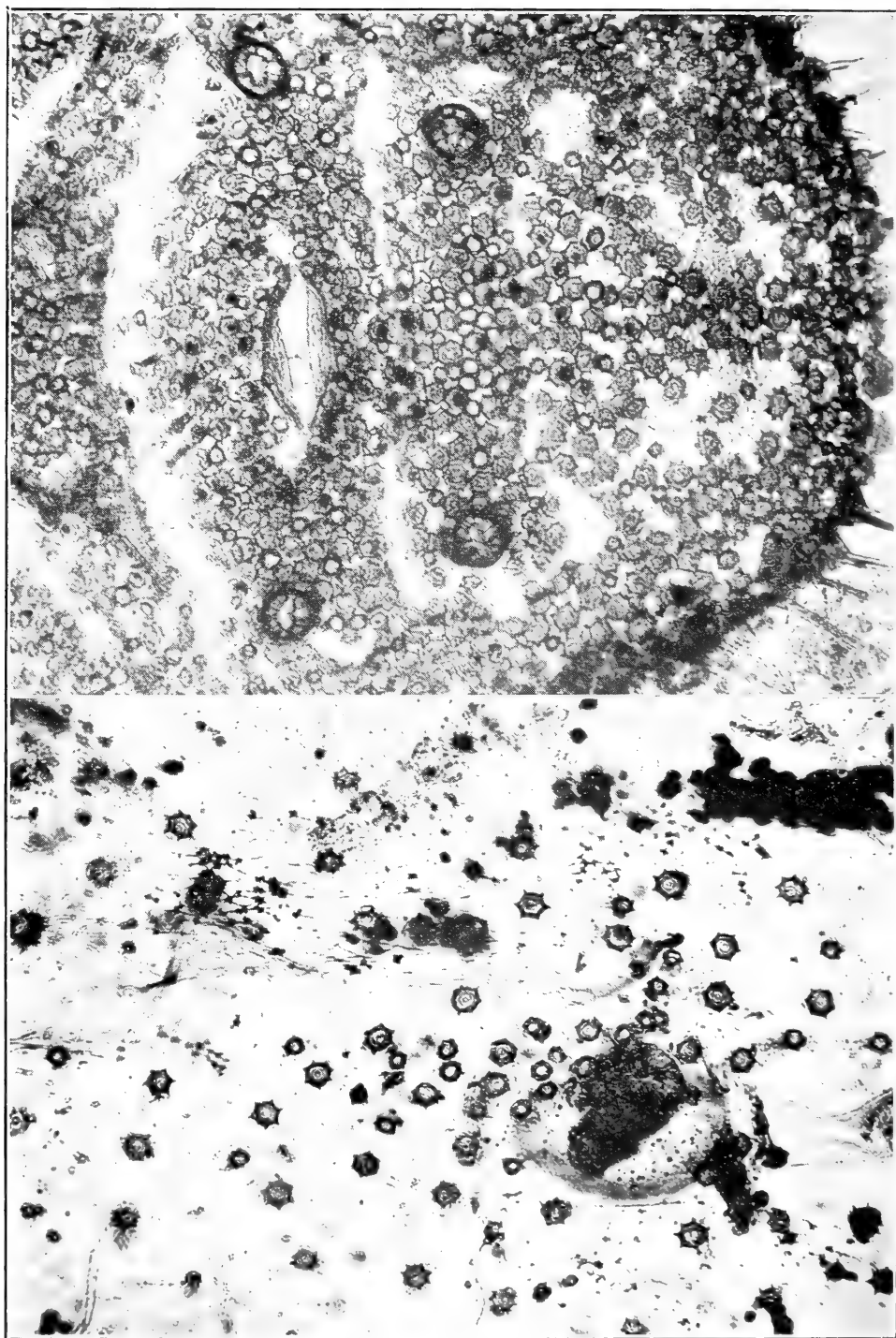
*Photo. F. N. Clark.*

LARVA OF *L. ARION*. COMPARING LEGS BEFORE AND AFTER HIBERNATION.

*A Natural History of the British Butterflies, etc., 1914,*

*(To face p. 339.)*

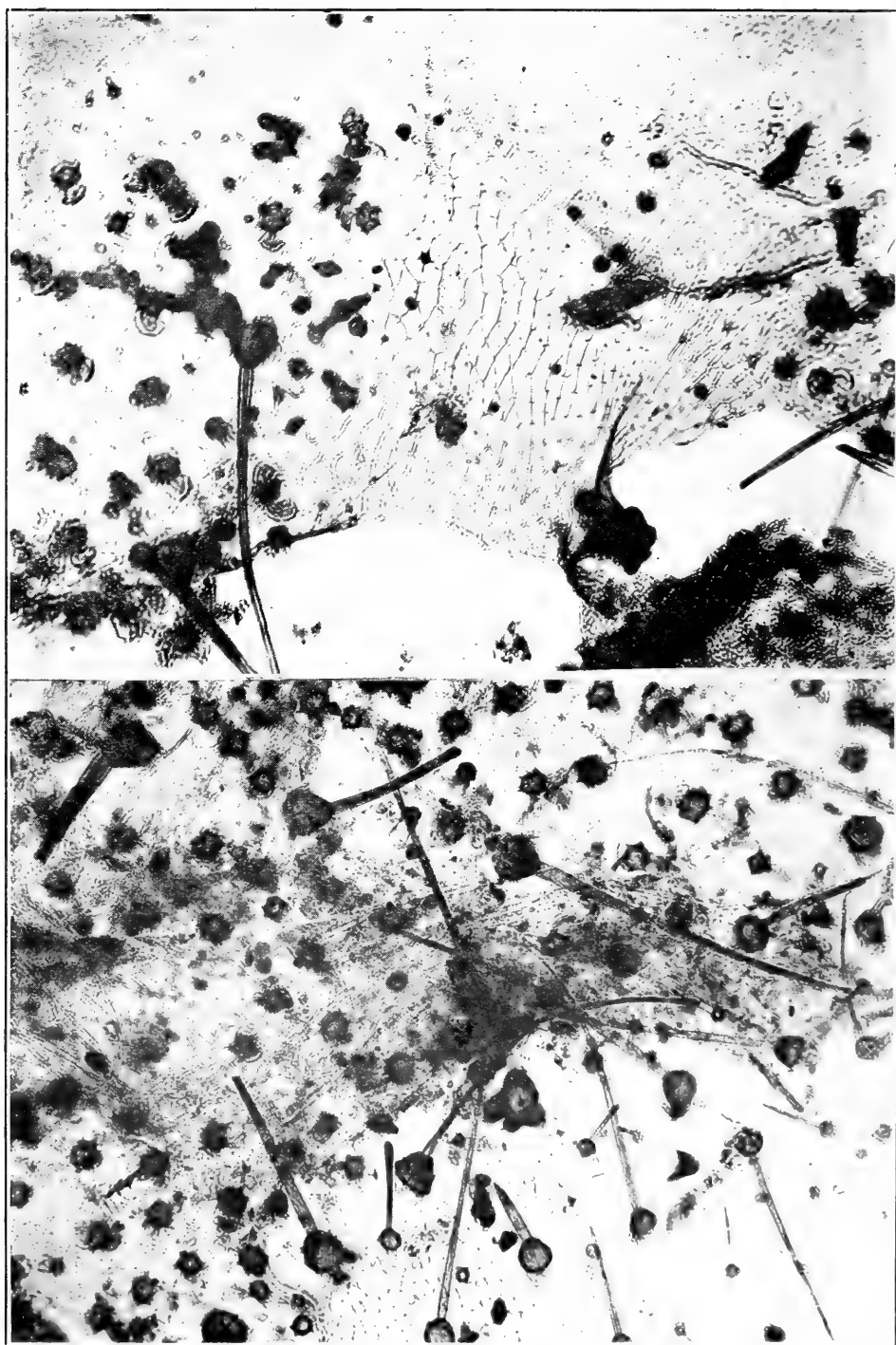




*Photo. F. N. Clark.*

LARVA OF *L. ARION*. LAST SEGMENTS OF LARVA BEFORE HIBERNATION AND PORTION  
OF SAME REGION AFTER HIBERNATION,  $\times 100$ .





*Photo. F. N. Clark.*

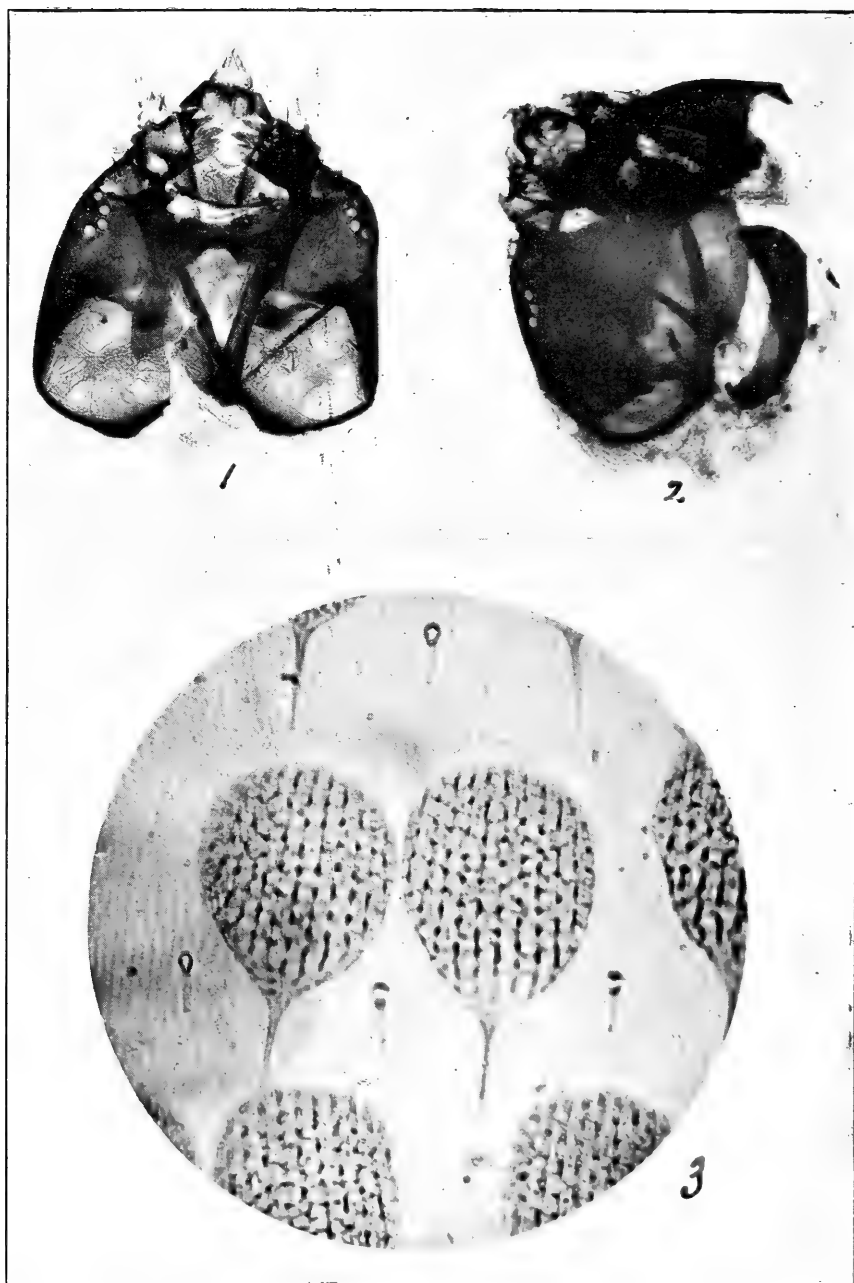
LARVA OF *L. ARION*. PORTIONS OF PROTHORACIC SEGMENT AFTER HIBERNATION  
SHOWING SKIN STRUCTURE, ETC.,  $\times 100$ .

*A Natural History of the British Butterflies, etc., 1914.*

*To face p. 339*







*Photo. F. N. Clark.*

L. ARION. HEAD OF LARVA. 1. BEFORE AND 2. AFTER HIBERNATION,  $\times 50$ .  
3. ANDROCONIA,  $\times 500$ .

*A Natural History of the British Butterflies, etc., 1914.*

(To face p 335)

very dirty, circumstances that are too clearly recorded in the photographs.

Pl. xxxviii. shows the true legs of the two larvæ  $\times 45$ , again of identical dimensions.

Pl. xxxix. shows the 7th and following segments of the autumn larva, and a portion of the skin of the same region of the full-grown larva, showing the identity of the hair-bases  $\times 100$ .

Pl. xl. shows two portions of the prothoracic region of the full-grown larva ( $\times 100$ ), to be compared with pl. xxxvi., fig. 1, and pl. xxxvii., fig. 1; the hairs and bases are identical, though their aggregation is so different. In pl. xxxix., fig. 2, and pl. xl., fig. 2, the reticular structure of the skin is well shown.

In the newly-hatched larva there is one peculiarity that separates it from all Plebeiid larvæ that I have examined, and from the Everid and Lycænopsid larvæ, of which, however, I have only seen *minimus* and *argiolus*. All these show immediately below the dorsal tubercules and above the supra-spiracular, two lenticles on each abdominal segment, these are, in fact, very conspicuous features of these larvæ. *L. arion* has only one lenticle in this space (apparently the upper one) and it is by no means a large and conspicuous one. The second lenticle is, however, occasionally present; I have a specimen in which the fourth abdominal segment has it on both sides. The other features of the larva do not distinguish it from the other first stage Lycænids referred to. The minute hair in front of i and ii is present. The posterior of the two hairs at iii is reduced to a point. The central of the three subspiracular hairs is much the longest. The hairs and lenticles on 7, 8, 9, and 10 (abdominal) vary from their distribution on those in front in much the same way as in other first stage Lycænids. These and other details will be seen in pl. xxxiii. better than by description.

In the second instar (pl. xxxiv.) the hairs are more numerous, and tend to be arranged across the segments in two rows. The dorsal lenticles do not increase in number, but several tend to appear (irregularly in different segments, and even on opposite sides) near the spiracles, *e.g.*, in pl. xxxiv., these appear near the left, and two close above the right, spiracle, on the first abdominal segment.

In the third instar the tendency for the hairs to divide into an anterior and posterior set on each segment is very obvious in pl. xxxv. as also the circumstances that two dorsal (apparently ii., not i.), and a sub-spiracular hair are conspicuously long (0.6mm.), and that the marginal hairs are well-developed. Plates xxxvi.-xl. will give a better idea of the developments of hairs, and on the last instar both before and after hibernation, than much description. The honey gland already conspicuous in the second instar is very well developed.

I am indebted to Mr. A. L. Rayward for a specimen of the pupa, and of a larva of *L. arion* just about to moult to pupa, my own search for these, over which I spent a week in Devonshire, having been quite barren, although I turned up various stones, and dug up not a few ants' nests, and made unavailing examinations in other directions. The result of my examination of this material was absolutely to confirm Mr. Frohawk's conclusion, that the larva that disappears in the autumn, shortly after entering its fourth instar, is still in the same instar when it is discovered quite full-grown in early summer.

I have over and over again reared the larva to the hibernating stage, but never get it any further, it is then in fourth instar, and of a size to suggest it is only in second or third. It is, nevertheless, the case, as proved by comparison of these with full-grown larva given me by Mr. Rayward, that it is already in its last instar, and that its next moult is to pupa.

The larva is very dark in colour, deep reddish-brown or reddish-black, making it very inconspicuous in the flower-heads of thyme, its general aspect and appearance is otherwise little different from other larvæ of "blues" in their early stages (Chapman).

FOODPLANTS.—*Thymus serpyllum*, Zeller, etc., etc. Rondou also mentions (*Cat. Lep. Pyr.*, p. 45) *Origanum vulgare* in May, but gives no details or references to support the statement, and appears to be unaware of the mystery surrounding the larva of this species after hybernation and the controversy so long carried on upon the subject. It is possible that he copied his statement from Bromilow, *Soc. Ent.*, xvi., p. 248, where the larva described probably did not belong to this species. Sand asserts that in Puy de Dôme the foodplant is *Gentiana cruciata*, and Stefanelli gives, with a query, *Papilionaceae*, on the authority of Quaedvlieg. [The Hon. N. C. Rothschild (*Ent. Rec.*, xxiii., p. 82) remarks that "Mr. Herbert Ashley has pointed out that it is possible that the larvæ of *L. arion*, after the third moult, feed on the nodules which are formed on the roots of furze and other *Leguminosae*. If this be so, the absence of furze in many localities where this insect occurs would be immaterial, as other leguminous plants grow there." He also suggests the possibility of their burrowing into the dehiscent seeds of furze or some other leguminous plant, though hitherto they have not been discovered in such situations. For the possibility of their being carnivorous after hybernation see *suprà* pp. 331-3.—G.W.]

PUPARIUM.—A pupa-case was discovered by Rayward and Frohawk in Cornwall on July 12th, 1906, just above which the newly emerged imago was drying its wings, and, directly after, an unemerged pupa. Both were near, but below, the surface of the ground, and neither showed any sign of being attached to the earth or to roots by girth or pad of silk, nor was any cocoon discovered. On the other hand, all the pupæ found at Bude by Mr. Percy Richards were enclosed in what he describes as an earthen cell, which exactly fitted the pupa (*Ent.*, xli., pp. 183, 228).

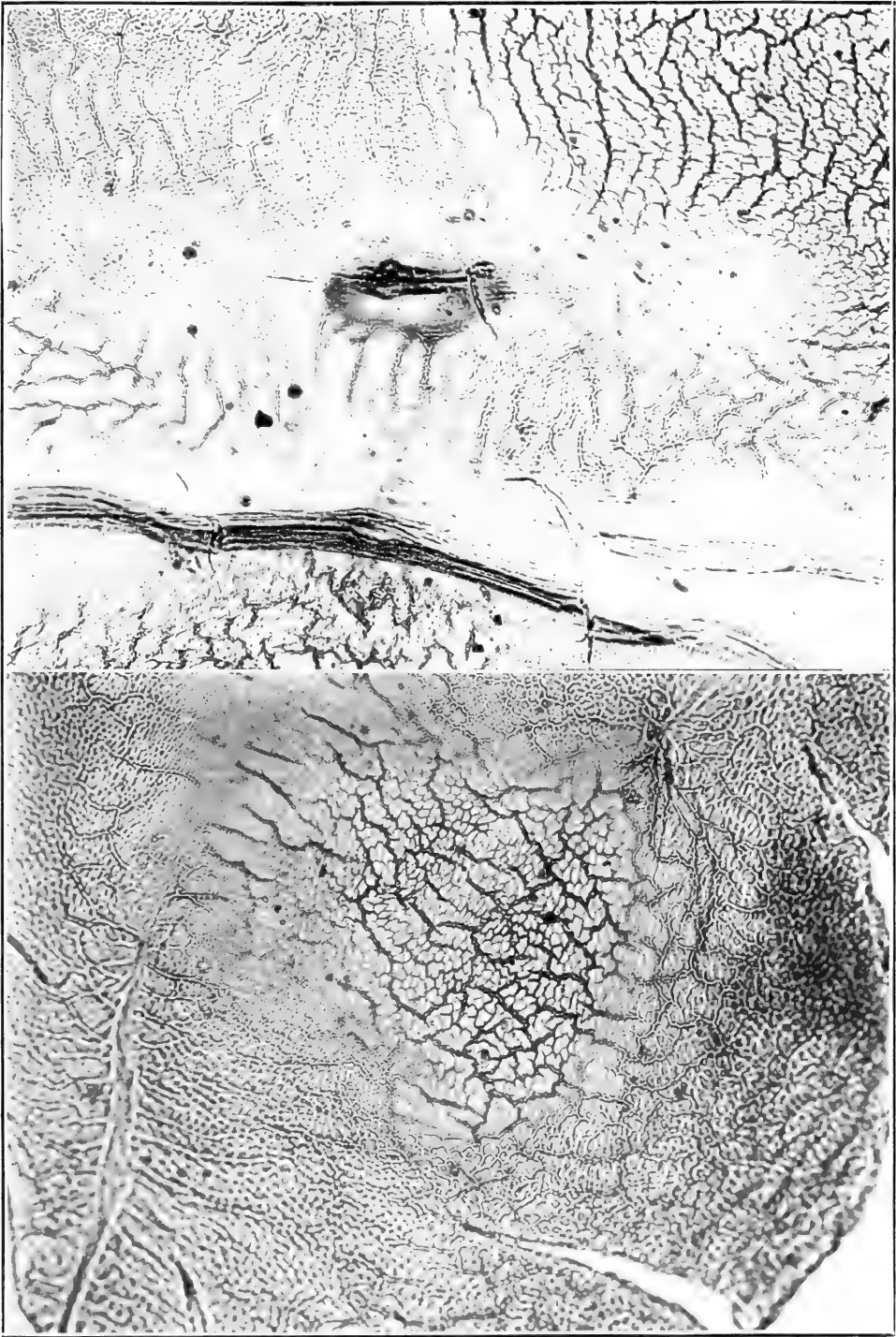
PUPÆ.—The pupa when newly-changed is a very clear, pale, apricot-yellow, which very gradually deepens to a dark amber-colour, except the wings, which remain light ochreous (June 10th, 1906). It bears a general resemblance to the pupa of *Plebeius aegon*, excepting for its much larger size. .5in. long. The entire surface of the mature pupa is minutely granulated and covered with very fine reticulations of a deep amber colour; spiracles are prominent and blackish, the surface posteriorly adjoining them is beset with a number of shining raised bead-like processes, some bearing minute amber coloured spines, which have the apical half branched with extremely small bristles. *Dorsal view*:—Across the middle its greatest diameter is  $\frac{3}{14}$ in. The head is obtuse, base of wings slightly angular and swollen, wing slightly concaved, abdomen swollen at third and fourth segments, then attenuating and rounded posteriorly. *Lateral view*:—It measures



*Photo, F. N. Clark.*

PUPA OF *L. ARION*. PORTION OF HEAD,  $\times 20$ . PROTHORACIC SPIRACLE COVER  $\times 100$ .





*Photo. F. N. Clark.*

PUPA OF *L. ARION*. SCAR OF HONEY-GLAND AND PORTION OF CREMASTRAL AREA,  
× 100.

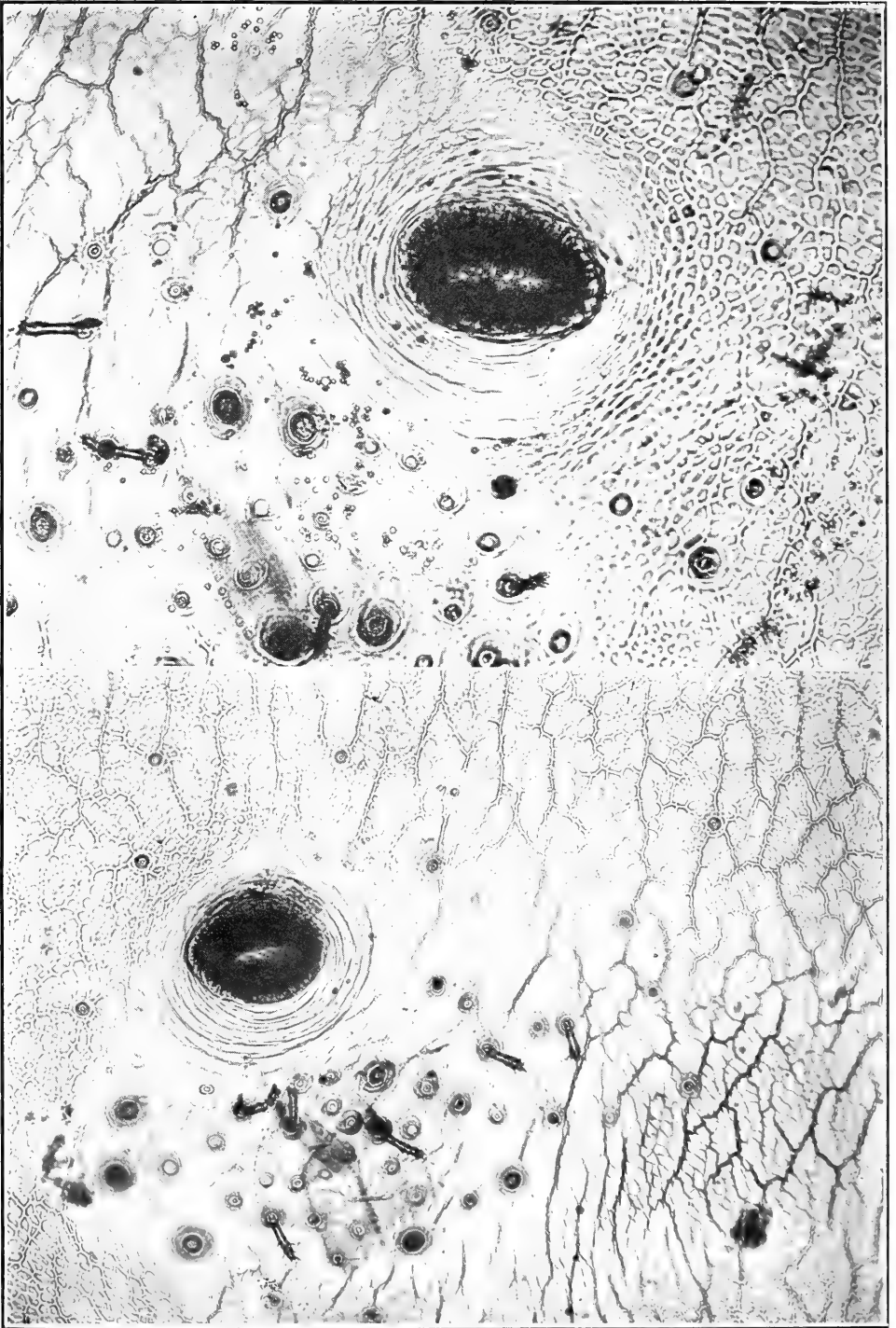
*A Natural History of the British Butterflies, etc., 1914.*

*(To face p. 340,*









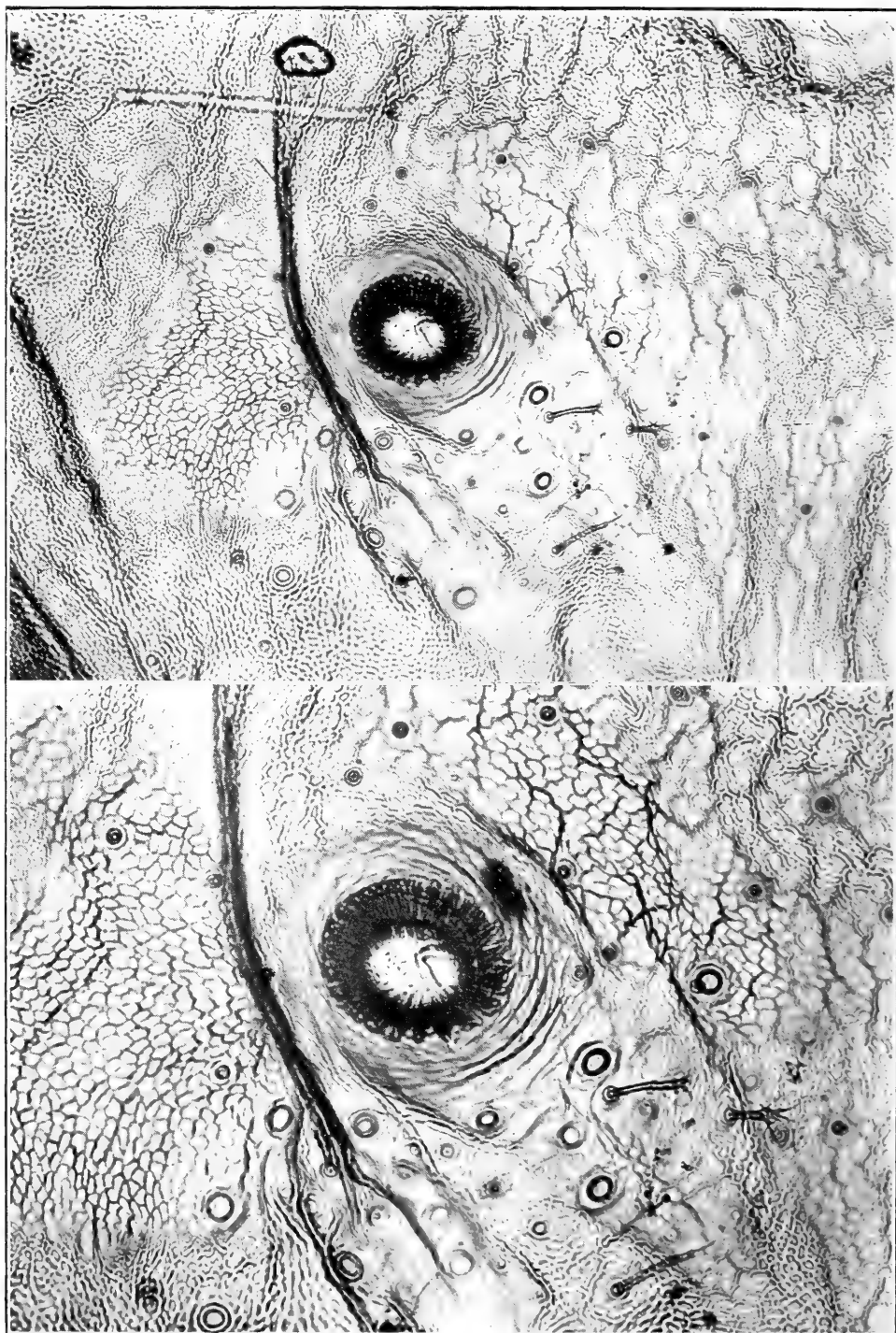
*Photo. F. N. Clark.*

PUPA OF *L. ARION*. SPIRACULAR REGION, RIGHT 5TH ABDOMINAL SEGMENT AND  
LEFT 4TH ABDOMINAL SEGMENT,  $\times 50$ .

*A Natural History of the British Butterflies, etc., 1914.*

*(To face p. 341.*





*Photo. F. N. Clark.*

PUPA (IMMATURE) OF *L. ARION*. FIFTH LEFT ABDOMINAL SPIRACLE,  $\times 100$  AND  $\times 150$ .

*A Natural History of the British Lepidoptera, etc., 1914.*

*(To face p. 341.)*

$\frac{3}{16}$  in. across the middle, the head rounded, thorax convex rising into a slight dorsal ridge, metathorax and first abdominal segment sunken, abdomen swollen at the middle and curving to posterior segments which are rounded; and segment is compressed to ventral surface, cremastral hooks absent, wing ample, swollen, and rounded across the middle and extending to the fifth abdominal segment. Pupa found wild, July 12th, 1905 (Frohawke).

The pupa is very similar to other pupæ of Lycænids, but of rather paler and lighter texture than those of most others. There is no pocket for ends of maxillæ. Hairs are few, but may be found near the spiracles, but small. They are terminally spiculated, with suggestions of being allied to the umbrella hairs of Chrysophanids, their length is only 0.06mm. The lenticles are also very small, (see pl. xlv., xlv.). These plates will also show the character of the network of the skin sculpturing; in this respect pl. xlv., fig. 2, is excellent.

A portion of the cremastral area is shown pl. xlv., fig. 2,  $\times 100$ . It shows no hairs, lenticles, hooks, or rosettes. Close by this area in the photograph are two very small symmetrical areas with a few amorphous rough points that may be vestiges of cremastral hooks. No definite rosettes, in fact, occur anywhere in the pupa. The scar of the honey gland (pl. xlv., fig. 1) is very distinct, perhaps rather more so than is frequent in pupæ of blues.

The larva given me by Mr. Rayward was so close to pupation that there existed within the loose skin an actual pupa, but with the wings, legs and antennæ in crumpled condition. Pl. xlv., fig. 2, shows the cover of the prothoracic spiracle in this pupa, it differs from that in the actual pupa only in being very slightly clearer for photographing. In both pupæ the actual spiracle beneath this is quite circular. Pl. xlv. is from the immature pupa; the structure of the spiracle is, perhaps, a little clearer than in pl. xlv. from the mature pupa (Chapman).

CHANGES IN COLOUR OF PUPA OF LYCAENA ARION.—When newly-formed the pupa is of a very clear, pale, apricot yellow, gradually deepening to a dark amber-colour, with light ochreous wings. When mature (four days before emergence) it was uniformly ochreous with the eyes dark leaden-green; it gradually turned darker on the head, thorax, and abdomen; the wings remained ochreous, but showed leaden-grey hind margins; then the median wing-spots appeared, and soon the whole pupa began to deepen more uniformly, until it assumed a deep leaden-grey all over, and remained unchanged for over thirty hours. A ♂ emerged at 8.30 a.m. on July 16th (Frohawke).

HABITS.—*Lycaena arion* is, as its powerful form indicates, a strong flier for a "blue." An example observed on August 21st, 1907, on a flowery bank at the termination of the Via Mala, flew across the road, up the steep bank, and away out of sight over the ridge above almost before one could recognise it. For speed it was more like a Coliad than a Lycænid. Similarly, on the slopes between Airolo and Brugnasco, when it is really busy on the wing in the hot sun, one finds the greatest difficulty in following it, and it will fly a considerable time without resting, and at such times almost the only hope of taking it is that it will frequently double back, or otherwise be tempted for a moment by the nectar of some flower and thus give one time to overtake it. We observed one on the morning of August 8th, 1907, flying briskly about 9 a.m., up the steep slopes at Brugnasco; it then zigzagged along the foot-

path for a short distance, easily keeping out of reach, until attracted by a plant of thyme, upon which it settled suddenly, and commenced at once sucking greedily at the nectar, its head buried deeply among the flowers. Between Airolo and Piotta, on the afternoons of August 3rd and 4th, the species flew very swiftly, settling rarely, up and down the flower-banks sloping down to a wide alder-carr. At the same place, on the afternoon of August 7th, after two most stormy days, the sun came out hot for about an hour; at about 4.30 p.m. two *arion* were observed at rest in the sun, but with their wings upright over their backs, and both on unexpanded flower-heads of scabious; they were, therefore, not feeding, but simply at rest. One stood on the top of the capitulum, its antennæ projecting in front, and viewed from the side, appeared to be very conspicuous; the other stood, head downwards, on the side of the flower, and was much less conspicuous, yet the dark leaden underside made it easily seen once the eye was in line with the insect. In spite of their seeming stillness, they were easily disturbed, and in the sun, flew off quite rapidly.

Our experience of the species, based on careful observation in Ticino, in 1907, is that it is exceedingly restless in the hot sun, flying swiftly, although with what appears to be a heavy, zigzag flight, at some distance above the herbage, which makes it somewhat difficult to follow on the steep flowering alpine banks it usually haunts in the Reuss and Ticino valleys; when at rest on flowers, however, it is easily approached and equally easily captured, but if startled, its dull, heavy blue-black colour is seen only for a moment, and one rarely gets a second chance at the same individual. At Chavoire the species was observed to fly rapidly and strongly in the hot morning sun, not remaining long at each rest, but at other times it appears to be less restless. Matthew observes that the butterflies are swift and strong on the wing settling suddenly on a sprig of heather or other flower, whilst Wheeler, in the same way, speaks of their suddenly appearing on the flowers of the wild thyme in the Rhone Valley and on the Simplon Pass, "coming apparently from nowhere." Marsden says that they love light, warm weather, and appear always to be still in dark, cloudy weather, only depositing their eggs when the sun is warm and bright; we, however, in the deplorably wet summer of 1910, when passing a day on Mt. Vuâche in company with Prof. Blachier, remarked that *arion* appears to fly more readily in dull weather than any other of the "blues" observed, the species we saw on that occasion consisting of *Cyaniris semiargus*, *Agriades coridon*, *Polyommatus hylas*, *P. icarus*, *Cupido minimus*, *C. osiris* (*sebrus*), *Aricia medon* and *Erebes alcetas*. Rapidity of flight does not always, however, characterise this species in the favoured haunts in which it apparently feels at home. Goss observes that on the Cotswolds "there was no probability of mistaking it for any other species, its larger size, dark iron blue colour, somewhat heavy wobbling flight, sufficiently distinguishing it; also that it naturally flies more in the manner of *E. tithonus* or *A. hyperanthus* than any of its congeners, but when pursued or frightened, is sufficiently strong on the wing.

Bond says that it is an easy insect to take, flying very low, conspicuous, settling occasionally on wild thyme in Barnwell Wold. Marshall again says: "It is usually an easy insect to take, and I think Dr. Bree right in describing the usual flight as not unlike that of *Coenonympha pamphilus*, but I have also seen it careering wildly about

the hollies and low bushes like *C. argiolus*." Merrin observes that on the Cotswolds the insect may be said to sail along; when it rests on a tall culm of grass, holding itself upright, it is fairly conspicuous, but towards dusk it often settles down like the other "blues," head downwards, to rest for the night.

Boisduval speaks of it as inhabiting dry places; Duponchel says the same, and adds that all his correspondents are in complete accord with him in this matter, and certainly the majority of its localities are of this kind; but, on the other hand, it has, like other "blues," at least an occasional predilection for water, as most lepidopterists who know the Swiss mountains can testify. Wheeler, for instance, remarks on its fondness for settling within splashing distance of the smaller mountain torrents, and Rowland-Brown relates (*Ent. Rec.*, ix., p. 25) how he found it between Montreux and Les Avants at the runnels by the roadside in company with *Plebeius argus*, *P. argyrognomon*, *Hirsutina damon*, *Agriades coridon*, and *A. thetis*. Instances might easily be multiplied, but the insect may then be said to be out visiting, rather than in its regular home corner. Stephens says that it haunts bramble-blossoms in rocky situations in North Wales, and Jäger (*Ent.*, xxv., p. 15) alludes to the same peculiarity, observing that at Biedenkopf it is to be found on sunny slopes, resorts to bramble-blossoms, flies quickly like *Colias hyale*, and is soon lost to view. Wheeler remarks on the same habit at Gondo and Isella.

DECADENCE OF LYCÆNA ARION IN ENGLAND.—Lewin (1795) reports the insect as "rare" on the wing in the middle of July, on high chalky lands, having been taken on the Dover Cliffs, Marlborough Downs, hills near Bath, and at Clifden in Bucks (*Hist. of Brit. Ins.*, p. 78). Donovan (1797) simply notes it as scarce, apparently no more common in any other part of Europe (*Nat. Hist. Brit. Ins.*, vi., p. 11). Haworth (1803) speaks of it as "very scarce, but taken in Bedfordshire by Dr. Abbott." Curtis (1824) repeats Lewin's localities, and adds, "Mr. Dale took one near Bedford and another at Monk's Wood last year, where several were captured. Mr. Griesbach told me it was abundant near Winchester many years since." Stephens (1828) observes that it is an insect of great rarity, found on commons and in pastures in the beginning of July, taken near Bedford (Abbott) in the "Mouse's Pasture" in 1819 (Dale), also near the signal-house on Dover Cliffs, and on bramble blossoms in rocky situations in N. Wales; several specimens taken in Kent in 1828, seemingly near Deal; also reported near Winchester in plenty, as well as Lewin's localities (*Illus. Brit. Ent.*, i., pp. 87-8). Between 1826 and 1857 many records occur in the *Zoologist*, and as collectors increased, the species was noted from various parts of the country, e.g., in Somerset Quekett reports taking 40 specimens at Langport, near Taunton, June 15th, 1833, whilst on June 15th, 1834, he captured 20, and Dale took 19. Newman adds that "subsequently Quekett visited the same locality on several occasions, and always with the same success." In Northampton Bree reports (*Zool.* 1853, p. 3,350) that the species was discovered about 1838 in Barnwell Wold, but very restricted in its habitat, and that of recent years many entomologists have come from different parts of the country, that Wolley, of Trinity College, Cambridge, took 50 to 60 specimens on one occasion, although the weather was unfavourable; whilst Bond, who also remarks on the very local character of the insect in the Wold, captured

many specimens, 49 on one occasion; Stainton adds (*Man.*, i., p. 60), that by 1857 it had become less abundant. It was then followed up in Devonshire; on June 17th, 1865, Bignell captured 36 specimens near Plymouth, some much wasted (*Ent.*, ii., p. 295), whilst the same year with some friends, Gatcombe captured several dozens in the same locality, at Bolt Head, and again many were taken in June, 1867 (*Ent.*, iv., p. 301), Bignell also gave directions as to reaching the locality, and although occasionally a few specimens have since been taken, it is very rare there, or as Bignell puts it, "The haunts of *L. arion* at Bolt Head must be looked upon as a thing of the past." During this same period, Gloucestershire was being closely worked for specimens. Marsden, Merrin, and Watkins told the world their localities (*Ent.*, iii., p. 314; iv., pp. 105, 120). It was first noticed June 17th, 1866, worked again in June, 1867, again in June, 1868, again in 1869, but was very abundant in 1870, somewhat irregular in appearance up to 1880, since which it has been very scarce. In spite of this, collectors from London year by year visited the spots which it had haunted, and in bad as well as better seasons captured all they could find. Thus Goss, in 1890, sought out three of the best known areas in which it was found, saw five specimens and captured all. The destruction of the original locality, near the Roman entrenchments, which has been cut up by timber-hauling and quarrying, to say nothing of grazing and golfing, is also suggestive. The species is now exceedingly rare in the Cotswolds. In 1893, the species was discovered in Cornwall, where it is locally abundant; it has been tremendously persecuted year by year since its discovery, thousands of specimens having been captured, some collectors going year after year, and accumulating hundreds for the purpose of exchange. In spite of this we have only hitherto been given the barest outline of its life-history—the egg (noted rather than described by Newman in 1870), the newly-hatched larva (noted by Porritt in 1870), an outline of the life-history of the larva previous to hibernation (Frohawke), and the pupa, and a short description of the full-fed larva (Rayward and Frohawk). For the rest, a really detailed scientific description of the early stages has only now been attempted by Chapman, and its history in its last instar is still a desideratum, so that we are still largely in arrears, so far as any exact knowledge of this species is concerned, in our information concerning the early stages and habits, especially in the last larval stage, of this species. It has been suggested that a series of "bad" seasons have exterminated the species in all its old haunts, but one feels convinced that the average season for the last century has been little different from those of the last 30 or even 100 centuries, and has little to do with it; except so far as the destruction by humans in bad seasons decreases its chances enormously, and that the general spread of agriculture, clearings of woods, increase in cattle, and other necessary concomitants attending the growth of the population in England from 5,000,000 at the end of the sixteenth century, 15,000,000 at the end of the eighteenth, to 40,000,000 at the end of the nineteenth century, have indirectly far more to do with the matter than we are inclined to allow. Edwards (*Journ. Northamp. Nat. Hist. Soc.*, 1891, no. 47) says that "it was formerly plentiful in Barnwell Wold on wild heathy land, where the wild thyme was abundant. Some years back the whole was burnt up, destroying the foodplant, and now not a vestige of wild



thyme remains." Irby notes (*Ent. Rec.*, viii., p. 82) the disappearance of *arion*, not only from Barnwell Wold, but also from another part of the country on Lord Lilford's estate, quite inaccessible to the public, and where its disappearance was apparently caused by the destruction of the foodplant and herbage by burning the pasture and by the the grazing of sheep. Prideaux, writing of its Devonshire haunts, where he found it again after an apparent absence of many years, remarks (in *litt.*): "I have no doubt whatever that the occasional burning of large tracts of gorse and other plants, practised on the coast, must have something to do with its uncertainty of appearance."

[Oberthür (*Lép. Comp.*, iv., p. 321) remarks that the species has never been abundant in England except in hot and dry seasons, and that the same is the case in Brittany, where it disappears and appears again. In this case, over-collection has certainly nothing to do with the matter, and from what I have seen of its haunts at Monterfil (where in some years it is common, and in others apparently absent) I do not think that there it is in any way a question of cultivation either.—G.W.]

TIME OF APPEARANCE.—There is no British species the time of whose appearance is more uncertain than that at present under consideration. Marsden observes that on the Cotswolds the average dates are June 10th-20th and only worn ones occur in July in most years, yet, in 1879, the first specimen was seen on July 8th, not another was seen till the 15th, and owing to the cold and wet weather, it was still emerging at the end of July, so that 1879 was some four to five weeks later than an ordinary season. Elsewhere, however, he states that the average date for *arion* near Gloucester is June 15th-25th, while Mathew observes that in the same locality they were well out by June 6th in 1868. Prideaux, again, reports its first appearance in S. Devon as being on June 28th in 1894, and July 7th in 1895, whereas in 1892 many specimens were wasted by July 4th, and he observed it in 1896 from June 14th-22nd. He further remarks (*in litt.*) that "neither the contemporaneous floral conditions, nor the accompanying butterfly life seem to be reliable guides as to when to look for *L. arion*." It appears to be largely a matter of the prevailing weather, and the following dates will give an idea both of the variation in its time of appearance and of the limits within which it may be expected:—June 28th, 1798, July 5th and 9th, 1799, near Bedford (Abbott); in Bedfordshire in 1803 (Haworth); July 14th, 1819, taken in the Mouse's pasture nr. Bedford (J. C. Dale); June 15th, 1833, nr. Langport (Quekett); July 3rd, 1833, in Monk's Wood, once (J. C. Dale); June 15th, 1834, at Langport nr. Taunton (Quekett); in plenty, August 5th, 1834, on Parley Heath on the borders of Hants and Dorset (J. C. Dale); June 8th-15th, 1835, at Langport (Quekett); June 29th, 1836, at Langport (J. C. Dale); July 14th, 1837, at Barnwell Wold (Bree); one between June 3rd-28th, 1841, at Wigsthorpe (Doubleday); 1849, taken in the Mouse's pasture nr. Bedford (Westwood); June 22nd, 1858, nr. Leckhampton Court (Tyre); June 8th-15th, 1859, in the Cheltenham dist. (Comyn); June 25th, 1859, several nr. Oundle (Whall); July, 1859, at Barnwell Wold (Sturgess); July 1st-7th, 1859, nr. Leckhampton Court (Tyre); June 17th, 1865, at Bolt Head (Bignell); June 6th, 1865, and onwards in Gloucestershire (Merrin); June 17th, 1866, on the Cotswold Hills (Marsden); July 7th, 1866,

at Bolt Head (Bignell); June 20th-29th, 1867, nr. Gloucester (not July 29th as stated in the *Annual*), (Marsden); June 1st-23rd, 1868, on the north-east side of Painswick Hill (Watkins); June 5th and 6th, 1868, on the Cotswolds (Marsden); July 1st, 1868, nr. Cheltenham (Demheski); June 12th, 1869, at Cirencester (Harman); June 13th-19th, 1869, common on June 15th, on the Cotswolds (Marsden); Many taken on or about July 1st, 1869, at Bolt Head (Gatcombe); June 20th, 1870, abundant on the Cotswolds between Gloucester and Cheltenham, some worn (Marshall); July 7th-8th, 1870, at Bolt Head (Mathew); June 15th, 1871, on the Cotswolds between Gloucester and Cheltenham (Marshall); June 21st, 1873, on the Cotswolds between Gloucester and Cheltenham (Marshall); June 18th, 1874, on the Cotswolds between Gloucester and Cheltenham (Marshall); July 15th, 1876, at Bolt Head (Mathew); July 17th, 1876, at Bolt Head (Brown); June 29th, 1878, on Stinchcombe Hill in the Cotswolds (Spiller); June 30th, 1879, in the Cotswolds (Fox); July 1st-8th, 1884, at Bolt Head (*teste* Bignell); June, 1890, on the Cotswolds (Stanger-Higgs); June 24th, 1890, on the Cotswold Hills (Goss); abundant by July 4th, 1892, many specimens being wasted, nr. Salcombe (Prideaux); August 30th, 1892, at Ludlow (Blackmore); June 28th, 1894, very scarce, first appearance for the year in S. Devon (Prideaux); June 20th-July 7th, 1895, in North Cornwall (Sheldon); July 7th, 1895, first appearance in S. Devon (Prideaux); July 22nd, 1895, in Cornwall (Farn); June 3rd, 1896, in the Cotswolds (Marsden); from June 14th-22nd, 1896, in S. Devon (Prideaux); June 20th-July 7th, 1896, in North Cornwall (Sheldon); July 9th, 1896, in Cornwall (Farn); July 24th, 1897, near Prawle Point, S. Devon (Sheldon); July 3rd-6th, 1900, near Bude (Kaye); June 22nd, 1901, in the Cotswolds (Rothschild); July 1st-4th, 1901, in the Bude distr. (James); July 8th, 1901, in Cornwall (Oldaker); June 22nd-July 12th, 1903, in Cornwall (Woodforde); June 23rd-July 17th, 1904, in Cornwall (Peed); July 7th-14th, 1904, in Cornwall (Robertson); July 10th, 1904, in N. Cornwall (Rothschild); June 18th-July 8th, 1905, in Cornwall (Peed); ♂ emerged July 16th, 1905, at 8.30 a.m. from pupa obtained July 12th in Cornwall (Frohawk); June 7th-July 13th, 1906, in Cornwall (Peed); July 1st, 1906, a ♀ newly-emerged, just above its empty pupa-case in Cornwall (Rayward); July 25th-31st, 1907, in N. Cornwall (Bell).

Abroad the time of appearance is somewhat complicated both by latitude and altitude, especially the latter, and records may be found constantly from early June to the middle or even the end of August; Eversmann gives May and June for S.E. Russia, Aigner-Abafi the middle of May to the middle of July for Hungary, and we have even one very surprising record from Digne for the first week in May, 1894 (Jones). As a rule, however, the usual time of flight is from the middle of June to the middle of July in the lowlands, and from the second or third week in July to the middle of August in the mountains. We have also sufficient records from Germany to show that the time of emergence differs as much in different years on the Continent as it does with us. In Scandinavia Wallengren gives early July, whilst Bang-Haas gives merely July for Denmark. July and August are given by Snellen for Gelderland, the only part of Holland from which it is reported, and Lambillion gives the same for Belgium. The great

range of latitude and altitude in France naturally results in the inclusion of the earliest and latest dates, and June and July in the plains, and July and August in the mountains, are the nearest approach to exactness that can be compassed, due regard being paid to latitude, elevation and season. The same may be said with regard to Switzerland. In Germany we find some apparent contradictions, which, no doubt, in the light of home experience, point to a different time of emergence in different seasons. In Pomerania July is given by Hering, who describes *arion* as abundant, while Plötz and Spormann regard it as very scarce. In East and West Prussia Speiser says that it appears in July and early August, which is borne out by the dates July 28th-August 3rd, given by Schmid for Dantzic, and July 2nd to August 3rd for Königsberg. For Hanover Rehberg gives July, and Glitz the end of June. The 2nd half of June is also noted by Maassen in the Rhine Provinces. In Hesse July and August are mentioned by Koch, a term which in Nassau is reduced to July by Rössler, and the early days of July by Fuchs, whilst Jäger gives the last half of August at Biededkopf. Speyer gives the middle of June to the middle of August for Waldeck, and Gillmer the shorter period, end of June to beginning of August, for Anhalt. Wilde gives June and July for the Province of Saxony and Fischer the same period for the Hartz district, while Bartel mentions July and August for Brandenburg and Kretschmer the same dates for Frankfort-on-Maine. In Silesia, whilst Wocke says June and July, Döring gives July and August. Similarly, Winkler's dates for the kingdom of Saxony are June and July, while other writers give July only; and in Bavaria Hofmann gives July, which is reduced by Schmid to the last half of the month, and extended by Kranz to the long period June to August. Mees and Spuler mention the equally lengthy period middle of June to August for Baden, and it must be remembered that both the Kingdom and the Grand Duchy have a great variety of elevation. In Austria much the same conditions prevail as in Germany. Nickerl states that this species is to be found in Bohemia in July and August, whilst Hüttner gives June and July for Karlsbad. July and August are also mentioned for Upper Austria (Brittinger), Lower Austria (Rossi), and Galicia (Nowicki), whilst Schneider gives the middle of June to August for Moravia, Höffner the end of June to August for Carinthia, and Hormuzaki took it fresh in the alpine region of Bukovina at the beginning of the latter month. In Russia Dampf gives July for Wilna and Romanoff the same month for Transcaucasia, whilst Nolcken states that *arion* occurs in the Baltic Provinces from the 20th of June far into July, and Bartel gives June for Urals. Zapater records it from the neighbourhood of Albarracin in July and all Chapman's dates for the central table-land of Spain are in the same month. In Italy, Norris took it in Piedmont near Certosa di Pesio in June and July, the early part of the latter month appears to be its usual time of emergence on the southern slopes of the Alps; Stefanelli reports it from Tuscany in the same month, adding that in some years it is also to be found during part of August, whilst Wheeler took it at an altitude of 4,000ft. in the Abruzzi, much worn by the middle of June. In Bulgaria Mrs. Nicholl found it in the middle of July, but in Bosnia during the last ten days of June, whilst for Roumania Fleck give July to September! In contrast to this Graves found

it worn at Therapia near Constantinople towards the end of June, but no observer makes any suggestion of a second brood. With regard to the time of its appearance in Asia we have scarcely any dates, the month of July being mentioned for the Amoor district by Staudinger, and for the Island of Askold by Oberthür. The following dates will illustrate and supplement these observations:— July, 1866, at Le Prese and Pontresina (F. B. White); June 28th-July 3rd, 1872, at Lucca (Walker); July 24th-31st, 1875, at Argèles in the Hautes-Pyrénées (Distant); June 28th-July 5th, 1878, at Zermatt (Jordan); July 6th, 1878, in the Val Bregaglia (Elwes); July 25th, 1878, in the Isle of Askold (Oberthür); between June 22nd and July 11th, 1879 at Le Lautaret, Oulx and in the Saas Thal (Forbes); June 3rd-5th, 1880, in the Visp and Saas Valleys (Jordan); September 1st, 1882, one at Pierrefitte Nestalas at 1,665 feet above sea-level (Jones); July 9th-11th, 1883, at Karlsbad (Becher); June 29th, 1884, at Monterfil (Oberthür); July 21st, 1885, at Stalden (Jones); June 1st-5th, 1886, at Brunnen, end of June, 1886, at Zermatt (Jones); June 29th-July 11th, 1887, at Vernet, July 12th, 19th, 1887, at Bagnères de Luchon, July 20th, 1887, at S. Sauveur (Elwes); July 8th, 1887, ♀s observed depositing eggs on wild thyme in Switzerland (Jefferys); July 18th-mid-August, 1888, at Wiesbaden (Prideaux); a fine large form June 5th, 1890, at Digne (A. H. Jones); June 26th-July 6th, 1890, at Engelberg, July 9th-15th, 1890, at Engstlen (Bethune-Baker); July, 1891, at Boscolungo, scarce (Norris); imagines June 11th-July 1st, 1893, in the Vallon des Fleurs, Nice (Bromilow); May 1st-7th, 1894, at Digne (Jones); July 18th-20th, 1894, nr. the Lac d'Oô at Bagnères de Luchon (Nicholson); August 1st, 1894, at Courmayeur, August 2nd, 1894, at Mont de la Saxe (Tutt); July, 1895, at Lausanne (Tutt coll.); beginning of July, 1895, at Kandersteg, on the Gemmi Pass above Loèche, at Inden and on the Riffelalp (Bath); July 10th-20th, 1895, in the Campiglio dist. (Lemann); July 18th, 1895 at Campiglio, July 20th, 1895 at Pejo (Chapman); July, 1896 on Monte Generosa, July, 1896, at Hospenthal, July, 1896, at Andermatt (Tutt coll.); July 30th-August 5th, 1896, worn, on the Col de Lautaret at 7,000ft. elevation (Tutt); August 2nd, 1896, between Montreux and Les Avants (Rowland-Brown); May 26th, 27th, 1899, at Veytaux (Wheeler); June 21st-24th, 1897, very fine between Sierre and Leuk (Postans); June 30th, 1897, worn between Cuenca and Albarracin (Nicholl); July 1st-7th, 1897, on the hill immediately behind Sépey (Wheeler); July 10th, 1897 at Villach, July 15th-21st, 1897, on the Sau Alpe and Kor Alpe (Lemann); June 17th-25th, 1898, at Montana, June 25th-July 4th, 1898 at Zermatt (Fleming); June 21st-28th, 1898, at Susa, common but worn (Rowland-Brown); June 22nd, 1898, nr. Travník, at about 4,500ft., June 25th-29th, 1898, at Jaiice (Nicholl); July 8th, 1898, onwards at Bérisal (Wheeler); July 8th-19th, 1898, very common at St. Nicholas (Lowe); July 26th-28th, 1898, at Grésy-sur-Aix (Tutt); June 7th, 1899, at Digne, (Rowland-Brown); June 18th, 23rd, 1899, locally abundant at Digne, June 28th-July 7th, 1899, at St. Martin-Vésubie (Lang); June 26th, 1899, on the Rilo Dagħ, July 5th, 1899, on the Liva Rika, July 9th, 1899, near Samakol, July 15th-17th, 1899, on the hills around Kostenec (Nicholl); June 28th, 29th, 1899, between Varzo and Crevola (Lowe); July 1st-12th, 1899, at Fusio (Chapman; July

1st-10th, 1899, at St. Niklaus, nr. Täsch, and in the Zmutt Thal (Rosa); July 14th, 1899, in the Petit Val, near Val André (Turner); July 25th-30th, 1899, on the Simplon, July 28th-August 5th, 1899, above the village of Simplon, August 12th, 1899, in the Ferpèche Valley (Tutt); June 26th-28th, 1900, at Berchtesgaden, June 29th-July 2nd, 1900, at Mödling, July 12th-20th, 1900, at Herculesbad (Lang); June 4th-July 5th, 1900, on the Splügen, July 26th-28th, 1900, at Brenner (Rowland-Brown); July 7th-21st, 1900, in the Pfynwald, the Simplon Pass and Bérisal (Rosa); July 1st-21st, 1900, at Pontresina, common July 23rd, 30th, 1900, at Guarda (Chapman); July 17th-25th, 1900, at Cortina, July 27th-30th, 1900, at Brenner (A. H. Jones); July 23rd, 1900, at Mürren (Wheeler); June 20th-25th, 1901, in the Eggenthal nr. Bozen (Lowe); end of June and early July, 1901, very common nr. Rochefort, and exceeding abundant at Arlon (Lambillion); July 16th, 1901, between Focha and Celebic, on the Bosnian and Montenegrin frontier (Nicholl); between July 18th and 26th, 1901, at Tragacete, one only (Chapman); July 19th, 1901, at Vidova (Penther); July 30th, 1901, at Annécý (Tutt); August 17th, 1901, between Bérisal and the summit of the Simplon (Keynes); June 22nd-28th, 1902, worn, at Certosa de Pesio, July 1st-8th in the Val Ferrex, July 7th, 1902, at Courmayeur (Lowe); June 27th, 1902, at Martigny, July 5th, 1902, at Brigue, July 11th, 1902, nr. the summit of the Simplon (Sheldon); July 5th-30th, 1902, nr. Villars (Moss); July 7th, 1902, at Theux (Mairlot); July, 1902, at Denée, rare (Hennin); July 17th, 1902, on the Maklenpass (Hilf); July 26th, 1902, at St. Martin Vésubie (Rowland Brown); July 29th-31st, 1902, at Chavoire, nr. Annécý, Aug. 2nd-8th, 1902, at Megève, August 14th-16th, 1902, at Lavancher, August 18th, 1902, worn, on the Brevent, August 22nd, 1902, at Chamonix (Tutt); June 1st-15th, 1903, at Houffalize (Derenne); June 23rd-24th, 1903, nr. Wassen (Keynes); July 1st, 1903, on the Simplon (Muschamp); July 3rd-13th, 1903, at St. Avertin, nr. Tours (Meade-Waldo); July 10th and 13th, 1903, in the Laquinthal, July 27th, 1903, on the Simplon (Wheeler); July 12th, 1903, at Moncayo (Chapman); July 12th, 1903, on the Sépey Road, July 19th, 1903, at Bérisal, July 26th, 1903, nr. Simplon (Sheldon); July 23rd, 1903, at Göschenen (Keynes); July 25th, 1903, worn, between Useigne and Evolène (Tutt); June 21st, 1904, at Platten (Pearson); June 29th, 1904, above Luan, July 22nd, 1904, at Reszino, July 23rd, 1904, near Roveredo (Wheeler); June 30th, 1904, at Maksimir (Grund); July 2nd, 1904, at Grindelwald (Lowe); July 3rd-22nd, 1904, at Puerto de Pajares (Chapman); July 9th, 1904, at Digne (Muschamp); July 11th, 12th, 1904, in the Laquinthal (Keynes); July 13th-20th, 1904, in the Laquinthal, July 25th-27th, 1904, at the entrance of the Val d'Anniviers (A. H. Jones); July 14th, 1904, on the Mendel zigzags, worn, (Rowland-Brown); July 27th, 1904, at Rudersdorf (Dadd); June, 24th, 1905, between Sierre and Evolène (Pearson); June 26th, 1905, nr. Oberstdorf, June 27th, 1905, in the Oythal, June 27th, 1905, on the See Alp, July 2nd, 1905, on the Sölleneck, Aug. 3rd, 1905, at Brenau (Dadd); June 27th, 1905, above Aigle (Gurney); June 29th-July 13th, 1905, between Lauterbrunnen and Wengen, July 28th, 1905, on the Simplon Pass (Moss); July 10th, 1905, at Campolungo, July 29th, 1905, in the

Steinenthal (Muschamp); July 21st, 1905, on the Gaisberg, July 22nd, 1905, between Salzburg and Grossmain (Bentall); July, 1905, at Pontresina (Lowe); July 27th-August 1st, 1905, not uncommon nr. Chateau d' Oex, August 3rd, 1905, at Kienthal, August 4th, 1905, at Kandersteg (Tetley); August 22nd, 1905, nr. Ausser Binn (Keynes); June 18th, 1906, at Caux, June 23rd, 1906, at Martigny (Wheeler); end of June, 1906, at Wassen (Pearson); July 1st, 1906, at S. Martin Vésubie, July 10th, 1906, at Digne, August 1st, 1906, at Geneva (Muschamp); July 1st, 1906, at Casayo (Chapman); July 6th, 1906, at Entrevaux (Powell); July 7th, 1906, at Villars Cotterets (Rowland-Brown); July 10th, 1906, in the Rosegthal (Keynes); July 14th, 1906, in the Wornitz, on the border of the Mosigkauer Haide (Gillmer); June 10th, 1907, at Isella, June 22nd, 1907, in the Murgthal, June 25th, 1907, in Weesen Marsh (Wheeler); June 17th, 1907, at Digne (Gurney); June 27th, 1907, at Vissoye (Pearson); July 8th, 1907, in the Ganterthal, July 9th, 1907, at Gondo, July 10th, 11th, 1907, in the Laquinthal, July 12th, 1907, at Alpien, July 13th, 1907, on the Rossboden Alp (Rehfous); July 16th, 1907, in the Steinenthal (Rowland-Brown); July 20th-30th, 1907, on the Dents du Midi, August 20th, 1907, at Barmaz (Muschamp); July 28th-August 4th, 1907, in the Laquinthal (Page); July 29th, 1907, at Andermatt, July 31st, 1907, in the Göschenenthal, August 2nd-8th, 1907, at Brugnasco, August 3rd-8th, 1907, St. Gothard, August 4th-7th, 1907, at Piotta, August 5th, 1907, in the Piottina Gorge (Tutt); June 6th, 1908, at Frenières, June 12th-14th, 1908, on the Simplon Pass (Tetley); June 28th-August 3rd, 1908, at St. Maurice-sur-Moselle, July 7th, 1908, at le Tholey, July 10th, 1908, in the Vallée de l'Ognon, July 14th, 1908, at Charmes (Gibbs); July 18th-Aug. 4th, 1908, on the Glärnisch (Muschamp); July 28th, 1908, at Bieberbrücke, August 12th, 1908, on the Ofen Pass (Tutt); July 30th, 1908, near the Glacier du Trient, August 18th, 1908, in the Zmutt-Thal (Page); June 7th and 22nd, 1909, at Vernayaz, June 10th, 1909, at Branson, June 16th, 1909, at Salquenen, June 19th, 1909, in the Pfynwald, June 18th, 1909, at the 2nd Refuge on the Simplon Pass, June 20th, 1909, in the Ganterthal, June 24th, 1909, at Aigle (Alderson); mid-June, 1909, in the Cserna Valley, July 5th, 1909, at Tatra Hohlenheim (Sheldon); June 23rd, 1909, Fiesch (Pearson); July 23rd, 1909, at Eclépens (Page); June 28th-July 26th, 1909, in the Vallée de Joux, July 5th, 1909, at Eclépens, July 16th, 1909, at Champagnole, July 18th, 1909, on Mt. Tendre, July 31st, 1909, on Mt. d' Or, July 31st, August 1st, 1909, at Vallorbe (Gibbs); July 28th, 1909, on Mt. Musine (Gianelli); August 6th, 1909, on the Arlberg, worn out, August 8th, 1909, on the Mendel Pass, worn (Tutt); June 19th, 21st, 1910, at Roccaraso, June 22nd, 1910, Palena (Wheeler); July 2nd, 1910, at Nyons (Rowland-Brown); beginning of July, 1910, at Herculesbad (Keynes); July 29th, 1910, on Mt. Vuâche (Tutt); August 6th, 1910, at Macugnaga (Bethune-Baker); June 23rd, 1911, at Faido, June 28th, 1911, in the Gondo Gorge, July 6th, 1911, at Altmatt, July 10th, 1911, at Bergün (Wheeler); June 30th, 1911, at Puymoyen, July 6th, 1911, at Eaux-Bonnes (Rowland-Brown).

HABITATS.—The old recorded localities for *Lycaena arion* in Britain, in most of which, however, it has long since been extinct are exactly the places in which it still occurs on the Continent. It evidently was

here, and is now, as a matter of fact, on the continent, an extremely local species, occurring sometimes in a limited area of a field, or a few selected corners in a long wild mountain valley, and when found out of these corners, flying with great rapidity in a headlong manner as if it had lost its way, and was anxiously returning to its lost home. Such old localities as the cliffs at Dover, the downs at Marlborough and Winchester, the hills near Bath, Barnwell Wold, the steep slopes at Bolt Head, the Cotswold and Cornish hills are ideal localities. Mathew's description of its habitat "to the westward of Bolt Tail where, between it and the next point, a slope sweeps down from the brow of the high land to the edge of the cliffs below, and where, at times, when the turf is dry and slippery, it is decidedly dangerous to approach too near the cliffs," might be written of its haunts at Brugnasco, in the high alps of the Ticino valley, where the same set of slippery slopes shelter it, among a host of other species, but where the sea is hundreds of miles distant. So too, "the rough fields of Polebrook, and on the outskirts of Barnwell Wold," where Bree found it so abundantly, and "the corner of a rough pasture under a wood" where Bond captured it, must have been very like the rough open bush-strewn spaces on the Grésy hills, and the rough level river-flats at Piotta, where it flies almost as freely as on the steep flower-clad banks at the edge of the alder-carr, and the roadside, and which carry the species here probably up the steep slopes to Brugnasco, about 1,000ft. above. At Langport, Quekett found it "in a situation abounding with long grass and brambles," and it was in just such a place, the rough uncultivated corner of a field the greater part of which was devoted to lucerne, and sloping above to a bush-covered hillside, that we found it at Chavoire, just above the charming Lac d'Annécý. "The long narrow valley among the Cotswold Hills" (Marsden), and "the spot on the Cotswolds sheltered by a stone wall" (Merrin), where they localised themselves at different times, remind one of the large sheltered flower-covered wastes by the sides of the road on the Simplon, where they love to swing on the flowers in the sun before hustling up the steep slopes, back again to their chosen corners. These Cotswold Hills, where *L. arion* lived, have been well described by Merrin (*Ent. Rec.*, ix., pp. 101-3), they are part of a range that extends really in a broken line from Dorset to Yorkshire; they are capped at their highest points, between 800ft.-1,000ft. above the sea, by the Great Oolite, but it is the hills of the Middle and Lower Oolite here which produce the greater number of insects and plants; they present wide, bare stretches of short or rough grass, with tufts of vetch, thyme, etc., stone walls taking the place of hedges, with woods of beech, larch, etc. In the *débris* of deserted quarry-holes, where *Pyrausta purpuralis*, *Ennychia anguinalis*, and *E. cingulalis*, flit about the flowers, where *Acidalia ornata* hides in the long grass, and *Polyommatus icarus* shelters in the friendly hollows of the rough ground, *L. arion* sails along, dipping down among the long grass, settling on a flower, etc. The ground that they mostly frequent, then, consists of deserted quarries, from which broken stone has been taken, the sides of the quarries being left sloping, and thick grass, with the usual herbage of hills, growing near. This herbage includes wild thyme, sun cistus, wild geranium, wild forget-me-not, milkwort, yellow trefoil, and several species of coarse grass. Even of so distant a spot as Constantinople Graves writes:—"I



have thus far only found *L. arion* on the European side of the Bosphorus near Therapia, where its presence was first reported to me by Count de Bukowky who took a ♀ specimen early in July in 1912. In 1913, an early season, *arion* was worn on June 24th, when I took a specimen near Therapia. Its habitat is a series of dry grassy, partially wooded, valleys in which thyme is common, and which, but for their greater dryness, much resemble the coombes of S. Devon and Southern England generally. The specimens I have seen are fairly large (42mm.-46mm.) and lightly coloured, but less lightly coloured than those from British localities. The localities in which *L. arion* occurs near Constantinople are all relatively cool, owing to their proximity to the "Bosphorus draught. With *L. arion* occur *Aricia anteros*, *A. astrarche*, *Polyommatus icarus*, *Heteropterus morpheus*, *Anthrocera punctum*, and *A. laeta*." But we cannot imagine anything in Britain quite like the wonderful little ravine above the Baths at Digne, with its sparking stream for a floor, its sides a maze of hazel, privet and clematis, above which are the grassy trefoil-covered banks, where Rowland-Brown found this species flying with a huge variety of other species, among others, *Polyommatus escheri*, *P. icarus*, *Agriades thetis*, *Cupido osiris* (*sebrus*), *C. minimus*, *Cyaniris semiargus*, etc., the females of which were on the banks, whilst the ♂s preferred the rich black mud in the bed of the Eaux-Chaudes. At Megève it occurred on a lovely flower-covered bank by the side of a mountain-meadow also covered with flowers, and abounding with *Brenthis amathusia*, *Argynnis aglaia*, *A. adippe*, *A. niobe*, etc. One of the most interesting localities when the species occurs is on the Brévent. It is met with quite at the foot of the scarred seam that leads almost from Chamonix to the foot of the Brévent. Here among the huge boulders, bushes and wild flowers abound, the raspberry canes being particularly numerous and hung with rich luscious fruit, *Lycaena arion* is to be found with an abundance of other butterflies, *Dryas paphia*, *Argynnis adippe*, *A. aglaia*, *A. niobe*, etc., as well as *Chrysophanus hippothoë*, *Heodes virgaureae*, *Loweia alciphron* var. *gordius*, etc. The species, indeed, is found almost up to the "Plan Pra" inn, at an elevation of 6770ft. The species was also found in the same neighbourhood, on some lovely sloping flower-clad hollows near Lavancher, that come right down to the edge of the rushing torrent of the Arve, the hollows themselves being divided by rough rocks or bushes, and which produced among other insects *Chrysophanus hippothoë*, *Heodes virgaureae*, *Loweia gordius*, *Dryas paphia*, *Argynnis adippe*, *A. niobe*, *Brenthis amathusia*, etc., and as wanderers from the higher levels, *Colias palaeno* and *Parnassius delius*. Sheldon found it in the meadows at Martigny among a number of other species, e.g., *Plebeius argus*, *P. aegon*, *Aricia medon*, *A. eumedon*, *Polyommatus icarus*, *P. hylas*, *Agriades bellargus*, *Cyaniris semiargus*, etc., and says that it also occurs at Brigue, under the cliffs along the banks of the Rhone, among *Melitaea didyma*, *M. parthenie*, *Argynnis niobe*, *Colias hyale*, *C. edusa*, etc., while Pearson found it in the mountain meadows about Evolène, with *Melitaea phoebe*, *M. didyma*, *Lycaena alcon*, *Cyaniris semiargus*, etc. Rosa found it not uncommonly on a rocky slope near Täsch, also in a meadow near St. Niklaus, whilst one was also taken near Aigle, on a path in the valley, in early July, 1899, and it also occurred in shady parts of the Pfynwald. In Denmark, Bang-



Haas records that it occurs principally in dry and sandy places, 'most abundantly in the heath regions of the south of Funen. Its habitats in Germany and Austria are of much the same kinds as elsewhere. Schmidt, for instance, remarks that he once took the species pretty abundantly between Schwerin and Ludwigslust in the heath, but still more abundantly in the forest near Mestlin, in a locality which was covered with heath. Rössler, again, says that in Nassau it is abundant in July in meadows, and also in the Mombach Forest, on the left bank of the Rhine, "in places where a tall reed-grass grows," whilst Limpert speaks of it as being abundant in the same month at Hanau, in clearings of the forest. In Hesse, Glaser observes that in July and August it is to be found in forest glades and clearings and also at the sides of little-used roads, and further states that it loves to wander about in dry meadows on the outskirts of woods, where the scanty vegetation consists chiefly of *Lotus corniculatus*, on which it is fond of settling, without, apparently, feeding from the flowers. Many similar habitats are described from different parts of Germany and Austria, but a somewhat different one is described in Salzburg by Bentall, who found it in August near the summit of the Gaisberg, at 4,200ft., with *Cyaniris semiargus*, *Polyommatus hylas*, *Chrysophanus hippothoë*, *Issoria lathonia*, *Melitaea athalia*, *Argynnis adippe* var. *cleodora*, etc. Dadd also found it near Oberstdorf in the Allgäu Alps at a spot where the river has formed an extensive sandbank overgrown with willow and other bushes, on which butterflies were common, and *Lycaena arion* occurred commonly with *Cyaniris semiargus*, *Agriades bellargus*, *P. icarus*, *Cupido minimus*, *Plebeius argus*, *P. argyrognomon*, *Chrysophanus hippothoë*, etc. It also occurred in the Oythal at the junction of the Oy and Trittach on a sunny bank with a great wealth of other species—*Melitaea dictynna*, *M. athalia*, *Brenthis euphrosyne*, etc., whilst it also occurred on the lower slopes of the Seealp with the same species; on the Sölleneck it also occurred in a mountain meadow with a host of lowland and sub-alpine species:—*Colias phicomone*, *C. hyale*, *Erebia melampus*, *Coenonympha satyrion*, *C. iphis*, *Euchloë cardamines*, *Agriades bellargus*, *Cyaniris semiargus*, *Cupido minimus*, etc. It was also seen in the Oythal occasionally with swarms of *Cupido minimus* at patches of damp earth. Of some of its haunts in France we have already spoken, but these by no means comprise all the situations in which it may be found. Turner, for instance, took it "in one corner of an orchard of the Petit Val (Côtes du Nord), on a bank overgrown with broom and bramble, with *Melanargia galathea*, *Epinephele tithonus*, *E. janira*, and swarms of other common things." Sand reports it from the Auvergne district as occurring in dry heaths and clearings of the mountain woods, whilst Oberthür describes a very characteristic haunt at Monterfil, in north Brittany, which he calls a "lande," a kind of rough heath-land, no part of which is level, yet whose acclivities and depressions could not be described except in a toy or fairyland sense, as hills and valleys, and where the short vegetation is constantly interrupted by outcrops of stone. In northern Italy its haunts are naturally of the same kind as those in the French and Swiss Alps. Wheeler, for example, found it not uncommonly in the few open spots of the marvellous Gorge of Gondo, probably the sublimest spot in the Alps, and, again, more frequently on brambles by the roadside between Gondo and Isella. Curò speaks of it as occurring in Italy in fields, meadows and woods, and Wheeler observes that he took

it at the edge of a very scanty wheatfield, over 4,000 feet up in the Apennines at Roccaraso, and also at Palena, in the same district, in a miniature gorge watered by a tiny stream. In Russia, Eversmann speaks specially of the spurs of the Urals as a favourite habitat of this species, whilst Assmuss remarks that in the neighbourhood of Tambow it is not uncommon in woodlands and (oddly enough) in gardens. In her interesting accounts of her expeditions in Bosnia and Bulgaria, published in the *Ent. Record*, Mrs. Nicholl several times mentions the occurrence of this species. She remarks, for instance, that in the former country it occurs in a marvellous butterfly corner in the Rilska valley, where granite blocks have rolled down from the precipices on a sheltered meadow at the foot of the woods, the broken ground now overgrown with all kinds of flowering weeds, and intersected by a tiny stream, forming a sort of natural rockwork, the best butterfly corner found in Bulgaria; here, on June 26th, 52 species of butterflies were taken before 3 p.m., for flying with *L. arion* were *L. alcon*, *Glaucopsyche cyllarus*, *Cyaniris semiargus*, *Celastrina argiolus*, *Polyommatus eroides*, *P. icarus*, *P. escheri*, *Aricia medon*, *A. eumedon*, *Agriades bellargus*, *Scolitantides orion*, *Heodes virgaureae*, *Chrysophanus hippothoe*, *Loweia dorilis*, *L. alcipliron*, *Rumicia phlaeas*, *Callophrys rubi*, *Parnassius mnemosyne*, *Colias edusa*, *C. myrmidone*, *Aporia crataegi*, etc., etc. *L. arion*, she observes, also occurred commonly on the Leva Reka, at 5,000ft. elevation, the specimens very bright and blue, where also *Brenthis euphrosyne* swarmed in the brushwood, and *Colias myrmidone*, *Melitaea dictynna* and *Hesperia serratulae* were also taken. It also occurred on July 6th at the bottom of the valley near the mouth of the gorge, where *Parnassius apollo* was just out, and *Colias hyale*, *C. myrmidone*, *Erebia ligea*, *Melitaea trivia*, *Brenthis hecate*, *Aricia eumedon* and other species were taken. In Bosnia she found the species on a plateau about 4,500ft. in height on the Vlasic Planina, above Travnik, where there are mountain meadows and much brushwood, among *Brenthis hecate*, *Aricia eumedon* and var. *fylygia*, *Cyaniris semiargus*, *Lycaena iolas*, *Polyommatus amandus*, *Coenonympha iphis*, etc. And again on July 16th, 1901, on the frontier of Bosnia and Montenegro, between Focha and Celebic the species occurred where the forests alternated with mountain-meadows, brilliant with flowers and swarming with insects. Among others that occurred with *L. arion*, were *L. arcas*, *Polyommatus anteros*, *P. amanda*, *Agriades meleager*, *A. corydon*, *A. bellargus*, *Chrysophanus virgaureae*, *C. hippothoe*, *Coenonympha iphis*, *Parnassius apollo*, *Apatura ilia*, *Limenitis populi*, *Vanessa io*, *Melitaea maturna*, *Brenthis amathusia*, *B. ino*, etc. Of the habitats of this insect in Asia no account appears to have been published, but judging from the localities from which it has been reported they would seem in all probability to be very similar to those which it affects in Europe.

**DISTRIBUTION.**—This species had formerly a fairly wide distribution over the southern half of England, though probably absent from the south-east, for which only a doubtful record exists for the county of Kent. It has never been reported from Scotland or Ireland, nor, indeed, farther north in England than Rutlandshire, and only a doubtful record exists from "North Wales." There were, in fact, three principal centres round which it was distributed, *viz.*, Northamptonshire, Gloucestershire, and Devon and Cornwall. Its former haunts in Bedfordshire, Buckinghamshire (if authentic),

Cambridge, Rutland, Huntingdonshire and Hertfordshire may be regarded as connected with the first, those in Herefordshire, Somerset, and perhaps Wiltshire with the second, and Dorset with the third, though its Hampshire and Wiltshire localities seem somewhat isolated. We have dealt elsewhere (p. 343) with its gradual disappearance and it is probably now confined to the counties of Gloucester and Cornwall, unless it still lingers on in some of its Devonshire haunts. The following is its recorded distribution in this country:—  
 BEDFORD: (Haworth), in the Mouse's pasture, near Bedford, in 1819 (J. C. Dale).  
 Bromham (*teste* Westwood). BUCKS.: Clifden (Lewin). CAMBRIDGE: Chatteris, near Cambridge (J.W.C.), (*E.W.I.*, vi., p. 178). CORNWALL: north (Sheldon), Bude abundant, Millook, Tintagel, etc. (Clark), east Cornwall, that part east of the high road from Truro, through St. Columb to the inland extremity of Padstow Creek (Rollason). DEVON: Salcombe. local and not abundant (Prideaux), Bolt Head (Mathew), Prawle Point (Sheldon), near Plymouth (Bignell), Dartmoor (Rogers), Bolt Tail (Gatcombe, Bignell). DORSET: Parley Heath (J. C. Dale).  
 Charmouth, once (Morris, *British Butterflies*, p. 134). GLOUCESTER: near Leckhampton Court (Trye), Stinchcombe Hill, near Dursley (Lathom-Brown), between Gloucester and Cheltenham (Marshall), Painswick Hill (Watkins), Dursley, Stroud (Marsden), [Forest of Dean, 1892, seen from a bicycle, not captured (Brooke). Confirmation is very necessary.]  
 Cirencester (Harman), Wotton-under-Edge (Griffiths), Rodborough Common, Sapperton, Misendene Park, Daneway Common (Musgrave). HANTS: Parley Heath (J. C. Dale), near Winchester (Stephens).  
 HEREFORDSHIRE: in the Aqueduct, Hereford (Harman, *Newman's Brit. Butterflies*, p. 140). [HERTS\*: Haileybury, seen 1898 (Stockley). Wants confirmation.]  
 HUNTS: Stilton, near Yaxley (Chambers *teste* Ingpen), Monks Wood (Dale), near Brington (Bell, *E.W.I.*, vi., p. 178). [KENT: Dover cliffs (Lewin), ? near Deal (Stephens).]  
 NORTHAMPTON: Wigsthorpe (Doubleday), Polebrook, Barnwell Wold (Bree), near Oundle (Whall). [NORTH WALES: (Stephens).] RUTLAND: Kington (Stainton, *Ent. Trans.*, 1858-61, p. 234). SOMERSET: hills near Bath (Lewin), near Langport (Quekett), Weston-super-Mare (Crotch.) [Not recorded in the county for half-a-century.]  
 SHROPSHIRE: Ludlow (Blackmore). WILTS: Marlborough Downs (Lewin, p. 78), Savernake Forest (Preston, *Newman's Brit. Butterflies*, p. 140).

Abroad the range of *arion* from East to West is as wide as that of the last species, extending from the Atlantic to the Pacific, from Finistère to the Island of Askold in the Bay of Vladivostock, but in latitude its flight is much more limited. It reaches northward only to the extreme south of Finland and Sweden, where it is very rare, and to the Baltic Provinces and the Govt. of St. Petersburg in Russia, whilst in Siberia Pokrofska is probably its northern limit. Southwards it extends to the table-land of Central Spain, and has been taken at the foot of Vesuvius and on Mt. Parnassus. There is a specimen in the Brit. Mus. coll., from the Godman coll., labelled Algeria, but this must be accepted with caution, since the species is unknown in southern Spain and Italy, and has not been reported from any of the Mediterranean islands with the exception of Corsica. In Asia Minor the only record of it is from the neighbourhood of Brussa (Mann), many years ago; Young records it from the Irak district in Persia, and it appears to be widely spread in Turkestan and occurs both in Eastern and Western Siberia and in Thibet. It is fond of broken and hilly country and rises to an altitude of at least 6,000ft.

\* The following note on "*Arion in Hertfordshire*" was received from Mr. A. E. Gibbs of St. Albans:—Mr. Bowyer, in his Haileybury List (1888), includes this species as occurring in the neighbourhood of the school, stating that "one specimen was shown up for the Cornthwaite prize some years ago." Mr. Stockley informed me, *in litt.*, that three *arion* were again seen in 1898, and that he was within a yard of one of them.

Throughout its range it is local and sporadic, often only occurring singly, though occasionally abundant even in districts where at other times it is not observed\* (though this does not necessarily imply absence); thus, in France, where it is widely distributed, it is reported to be absent from Normandy (Dupont), and the name does not occur in by any means all the existing departmental lists; in Holland it is confined to Gelderland, and apparently to one place in that province; in Spain it seems to be restricted to the northern half of the central table-land; in Italy, except in the Alpine regions, it is only reported from the Central Apennines, except in Tuscany and de Sélys Longchamps' single record from the foot of Mount Vesuvius; in Turkey it has been found only near Therapia, in Greece only on Mt. Parnassus, and whilst occurring in most of the existing lists of the central and southern Governments of Russia, it is absent from Melioransky's list of the Crimea and Kroulikowsky's of the Government of Jaroslav. In Germany it is stated by Speiser to be everywhere, except in a few regions of the northern plain, in more or less abundance, but in the very full list of German records supplied to us by Gillmer we find much to the contrary; for instance, in Mecklenburg, where seven localities are cited, in one of which it is "very rare," we find:—"not observed at Wismar, not at Gadesbuck (Schmidt); not at Friedland (Stange); not observed at Lubeck (Tessmann)." The different accounts of its abundance or otherwise given by different observers in the same locality points to the same uncertainty of appearance as it displays with us, which is more directly exemplified by the observations of Laplace as to the appearance of the species in the Sachsenwald (see *infra*, p. 359). It seems also liable to disappear, to some extent, from localities where it was formerly abundant; thus Hering reports it as "abundant" in Pomerania when writing in 1840, but a lapse of 40 years causes him to modify this opinion considerably, for in 1881 he speaks of it as "widely distributed but rare." In Switzerland it is to be taken almost everywhere, but it is very unusual to see more than one or two at a time, except in a few mountain valleys, such as the Leventina, where it may occasionally be seen in fair abundance. In Asia its distribution is wide, but so vast a portion of its area is quite, or almost, unexplored, that it is impossible to draw conclusions from the meagre records at our disposal. The specimens, however, sent from any given locality are so few that it would seem likely that its occurrence is as sporadic as in Europe. It is reported (once) from the north of Asia Minor, and the north of Persia, occurs throughout Turkestan and in the few explored portions of Thibet, in the Thian-Shan range, the Ala Tau, Tarbagatai and Altai mountains, but does not, so far as known, touch the Himalayas. In all this part of Central Asia it seems to be a mountain species, but further north this ceases to be the case and it occurs round the Lake Baikal, in various parts of the steppes in, and to the west of Irkutsk, as far north as Pokrofska, and in the valley of the Ussuri, where it assumes very large proportions, and finally in the Island of Askold. The following list of localities contains, we believe, most of its recorded

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\* This is in marked contrast with the habits of other "blues," and implies that there must be something in the habits of the larva to account for it; I have attempted to throw some light on the matter above, pp. 331-333 (G.W.)

haunts, but there are no doubt very many others which have not been explored, or for which no list of the fauna is available.

[AFRICA.—ALGERIA :—(Godman coll.)] ASIA.—ASIA MINOR :—near Brussa (Mann). PERSIA :—Irak distr. (Young). SIBERIA :—Altai (Elwes)—Ongodai (Berezowsky); Amoor (Staudinger)—Ussuri (Oberthür); Island of Askold (Oberthür); Irkutsk—Pokroftka (Graeser), Irkutsk (Elwes), Minusinsk (Sushkin), Transbaikal—Kiachta (Eversmann); THIBET :—Ta-tsien-lu (Oberthür), Amdo (Elwes), Kokonor (Grum-Grshimailo). TURKESTAN :—Ala Tau, Tarbagatai (Haberhauer), Thian-Shan, Koulja (Alphéraky), Narün (Courvoisier), Alexandroffsky mtns. (Brit. Mus. coll.) EUROPE.—AUSTRIA-HUNGARY : distributed from the lowlands to the Alpine region (Höfner). Upper Austria—Ischl (Hormuzaki), neighbourhood of Linz, Micheldorf, Herndl (Hinsl); Lower Austria, not rare in the mountains (Rossi)—Gresten (Schleicher), Hernstein distr. (Rogenhofer), Mödling (Lang); Bohemia—Prague, not rare (Nickerl), Karlsbad (Becher), Senftenberg (Fritsch); Bukovina—Crasna, Lutschina, Munceln, Raren (Hormuzaki); Carinthia, distributed throughout, but nowhere abundant (Höfner)—Portschach (Wagner), Friesach (Rühl); Sau Alp (Lemann); Carniola—Oberfeld (Mann); Croatia—Josifdal (Mann), Ogulin, Fiume, Lipik (Aigner-Abafi); Dalmatia (Mann); Galicia—near Cracow, Liszki, Myslachowicz, Krynica (Zebrawski), Czaplach, Radlowicz, Husla, Janowic (Nowicki); Hungary, throughout, but local (Aigner-Abafi)—Herculesbad (Keynes), Mehadia, one of the commonest blues, Kavarán-Szekul (Miss Fountaine), Czerna Valley, Tatra Hohlenheim (Sheldon), Bresztova, Zodna, Szulló, Teplitz near Trencsin (Vámgel Jenő), Budapest, Nagyvárád, Felixfürdő, Eger, Pécz, Szasz, Erzttergom, Szintye, Visegrád, Győr, Felsőölvő, Sopron, Pozsony, N. Levárd, Tavernok, Verebely, Besztesscebánya, Radvány, Szliács, Zolyom, Gács, Rozsnyó, Kocsocz, Gölniczbánya, Igló, Száplak, Eperjes, Kassa, Pálfalu, Margitfalu, Bocsko-Rahó, Fekete-Ardo, Orsova, Nagyg, Rea, Nagyszeben (Aigner-Abafi); Salzburg—Salzburg (Bentall), Guggenthal, the Gersberg, Hellbrunn (Richter), the Gaisberg (Bentall); Styria—Sunk, near Trieben, on the Schafferweg (Kiefer), Judenburg (Preszczek), Villach, Kor Alp (Lemann); Tirol—Mendel Pass, the Brenner, and Stelvio Passes (Rowland-Brown), Botzen (Lowe), Navis, Geschnitzthal (Galvagni), Glockner distr. (Mann), Innsbrück up to 6,000ft., Taufererthal, Solsteinkette (Weiler), Seiser-Alp (Gredler), Stubai-Alps (Heller), Franzenshöhe (Speyer), the Dolomites in the Popenathal, Plätzenwiesen near Dürrenstein (Rogenhofer), Pejo (Chapman), Campiglio (Lemann), Bregenz (Fritsch), Klausen, Atzwang (Frähstorfer); Vorarlberg—Arlberg (Tutt). BELGIUM : Arlon, common (Castin), Rochefort (Lambillion), Theux (Mairlot), Houffalize (Derenne), Orthe (Slégers), Han-sur-Lisse (Sibille), Valley of Semois, common (Smekens), Virton (Cabeau), Bouillon (Wanlier). BOSNIA AND HERCEGOVINA :—Maklenpass (Hilt), Kalinovik (Schreitter), Bjelasnica, Lakat-Cernero, Trebevic, Volujak (Apfelbeck), Nevesinje (Uhl), Vidova (Penther), above Travnik. Prenj, Sarajevo, on the Montenegrin frontier between Focha and Celebic (Mrs. Nicholl). BULGARIA (Bachmetjew) :—on the Rilo Dag, the Leva Reka, near Samakov, on the hills round Kostenec (Mrs. Nicholl). CORSICA :—St. Pierre-de-Venaco (Oberthür). DENMARK :—Zealand, Funen, near Helsingör (Bang-Haas). FINLAND, only in the extreme south, and very rare (Federley);—Nyland (Tengström). FRANCE :—generally distributed, but local; not in Normandy (Dupont *in litt.*) :—Ain—Gex, Bois de Fernex (A. Pictet); Thoity (Mongenot), La Faucille, Mt. Rond, Crozet (Denso); Aisne—Villars-Cotteret (Sheldon); Allier—Moulins (Peyerimhoff), Alpes-Maritimes—Vallon Obscur, Nice (Bromilow), Bollène (Lang), St. Martin-Vésubie, and generally in suitable localities in the mountains (Rowland-Brown), Mt. Pacanaille, Mentone (Oberthür); Ardennes—environs of Mezières (Demaison, *in litt.*); Aube—Bar-sur-Aube, Clairvaux, Les Riceys, rare (Jourdeuille); Basses-Alpes—Digne, very common (Gurney), less so at Larche, Allos, and Barcelonnette (Rowland-Brown), Entrevaux, Mt. Gourdon (Powell), Garamagne, valley of the Roubion, very variable (Oberthür); Basses-Pyrénées—on dry hills at Urcuit, Mouguerre (Laralde), Eaux-Bonnes, Col de Lurdé (Rowland-Brown); Calvados—reported doubtfully (Fauvel); Cantal—Le Lioran, Murat (Sand); Charente—Angoulême, of the British form (Oberthür); Charente-Inférieure—Royan (Dupont); Dompierre-sur-Mer (Rowland-Brown); Cher—St. Florent, Sologne (Sand); Côte-d'Or, in the forest region (Carteron); Côtes-du-Nord—Val André (D. Turner); Creuse—Guéret (Sand); Deux-Sèvres, occurring throughout the region (Getin and Lucas),—Saibart (Lacroix); Dordogne, rather rare,—Lembras, Queyssac (Tarel); Drôme—Gorges of the Bourne, la Chapelle-en-Vercors, Nyons, a very fine form (Rowland-Brown); Doubs—Besançon, etc. (Bruand); Eure-et-Loir, not very

common (Guenée); Finistère—south and west of the canton of Pont l'Abbé, abundant on the heaths of Kermenhir and Loctudy (Picquenard), Menez-Hom (Brandicourt); Gironde—environs of Bordeaux (Robert Brown, *in litt.*), Fargues, La Tresne (Trimoulet); Haute-Garonne—Roquefort, St. Martory, Luchon, etc. (d'Aubusson), Aspet, Ardèche (Caradja), Lac d'Oô (W. E. Nicholson); Haute-Marne—Hortes, Latrécey, Montigny (Frionnet); Haute-Saône—Val de l'Ognon (Gibbs); Belfort, Lachapel-le-sous-Rougemont (Peyerimhoff); Haute-Savoie—Chavoire, Megève, Lavancher, the Brevent, Mt. Vuache (Tutt), Chamonix (Melvill), foot of the Salève (Denso), Chaumont, Arcine (A. Pictet); Haute-Vienne—environs of Limoges (Samy); Hautes-Alps—Le Lauteret (Forbes), La Grave (D. Pearson); Hautes-Pyrénées—to 5,000ft. (Elwes), generally distributed (Rondou, *e.g.*, Pierrefitte-Héas, Gavarnie (Bath), Cauterets, etc. (Rowland-Brown), Argèles (Distant), Pierrefitte-Nestalas (Jones); Ille-et-Vilaine—Monterfil, Laille, Bourg-des-Comptes (Oberthür); Indre—Brenne, very common (Martin), Bois de Vavrey, Nohant (Sand); Indre-et-Loire—Amboise (*cit.* Rühl), St. Avertin near Tours (Meade-Waldo); Isère—Bourg d'Oisans (Pearson), Clelles (Rowland-Brown); Jura—Champagnole (Gibbs); Loire-Inferieure—La Bouvardière (Bureau); Loir-et-Cher—Bois de St. Gervais, near Blois (Chevillon); Lozère—Florac, Château-de-la-Caze (Rowland-Brown); Maine-et-Loire—Chaloché, Milly, Pignerolles, Le Vaudelnay, very common (Delahaye); Marne—Rheims, rather rare, Bois de Soulain, Brimont (Demaison); Meurthe-et-Moselle—Bois de Vandœuvre, Nancy (Cantener); Morbihan (Griffiths, but not recorded by de Johannis); Oise (Pinart); Orne—near Vimoutiers and Bagnoles (Fauvel); Puy-de-Dôme (Sand), dry granite hills (Guillemot) La Bourbouille (*cit.* Kane); Pyrénées-Orientales—Le Vernet, Bagnères de Luchon, St. Sauveur (Elwes); Villefranche (de Graslin), Montlouis (Struve); Sorède (Sprüngers); Saône-et-Loire—La Senetrière, Blanot, rare (André), only in the mountains of Uchon, Mt. Beuvray, Briseou (Constant); Sarthe (Desportes); Savoie—Annécly, Grésy-sur-Aix (Tutt); Seine—environs of Paris (Goossens); (probably refers to the next two departmental localities); Seine-et-Marne—Fontainebleau (Giard); Seine-et-Oise—Côte d'Aulnay, Versailles, Ville d'Avray, Lardy (Giard); Seine-Inferieure—Mont Fortin, rare (G. Viret), but not included in Noel's Catalogue of the department; Tarn—Castres (Galibert); Var—mountains round Cannes (Warburg), Draguignan (Segond); Vendée, throughout the region (Getin and Lucas); Vosges—Epinal, near Dogueville (Cantener), St. Maurice-sur-Moselle, Charmes, le Tholy (Gibbs). GERMANY: throughout, except a few districts of the northern plain (Speizer); Alsace-Lorraine—Colmar, the Semmwald, Ste-Marie-aux-Mines, Mt. Bachoffen, Ribeauvillé to Hunawihr, Strasbourg, banks of the Rhine, from la Robertsau to la Vantzenau, Mt. St. Quentin, Metz (Cantener), Mulhausen, forests of the Semmwald, of Bruebach, and of Lutterbach (Peyerimhoff); Baden, everywhere in the mountains up to 2,000ft. (Reutti), the Schwarzwald and Odenwald (Spuler), near Karlsruhe, Baden, Bruchsal, Durlach, Ettlingen (Gauckler), Freiburg, Hinterzarten (Warren); Bavaria—Regensburg, Kelheim, Wörth (Schmid), Munich (Kranz), Augsburg in the Siebentischwald and the banks of the Lech and Wertach (Freyer), Kempten, Allgäu Alps (Kolb), Berchtesgaden (Lang), Oythal, Seealp, Oberstdorf, the Sölleneck (Dadd); Brandenburg—Berlin, not rare, Grunewald, Finkenkrug, Kopnick Forest (Pfützner), Jungfernhaide, Potsdam, Rahnsdorf, Birkenwerder (Bartel and Herz), Brenau (Dadd), Frankfort-on-Oder, Rosengarten, Cunersdorf, Boosen (Kretschmer), Neu-Ruppin, abundant (Gillmer); Brunswick and Anhalt—Brunswick, Helmstedt (Heinemann); Mosigkau forest, Hirtenhau, Speckinge, Petersholz, abundant (Amelang), Hoyersdorf, Thorhaus, Brachmeierei, Wörnitz, Klein Zerbst Forest, Lödderitz Forest along the Elbe dyke, singly (Gillmer), Ballenstedt (Brunn); Hannover—Lüneburg, not common (Steinworth), near Bremen, rare (Rehburg), Eilenriede, rare, formerly commoner (Glitz), Lengerich, Menslage, Hameln (Jordan); Hartz—Wernigerode, not rare, formerly abundant on the Ziegelsberg (Fischer), Göttingen, Quedlinburg, Osterode (Jordan); Hesse—Frankfort-on-Maine, Giessen (Koch), Bad Ems in the Taunus (Sich), Wiesbaden (Prideaux), Steinen (Schenk), Nassau, Mombach Forest (Rössler), Usingen, common, less so at Oberursel (Fuchs), Hanau, abundant (Limpert), Cassel (Borgmann), Rotenburg, not rare (Jordan), Biedenkopf (Jäger); Mecklenburg—Neustrelitz (Messing), Rülów (Sponholz), near Sülze, very rare (Koch), Neubrandenburg (Scharlen), Schwerin (Völschow), the Teufelsmoor, near Waren (Busack), Parchim (Gillmer); Pomerania, abundant (Hering, 1840)—once at Güst (Paul and Plotz), at Barth and near the “Andershöfer Teich,” very rare (Spormann), Isle of Usedom (Riesen); Posen—Hohensee Santomischel, the Eichwald, singly in 1887, but abundant in some places in 1902 (Schultz); East and West Prussia, not rare (Siebold)—Königsberg, Rastenburg, Braunsberg, Wallenberg, Thorn,



near Danzig and Elbing, not abundant (Schmidt), Memel, Tilsit, Neukuhren, Rauschen, Caphornsche Haide, Metgethen, Ludwigsort, Locken, Osterode, Rominten, Arys, Johannisberg, Willenberg, Graudenz, Rosenberg, Jastrow (Speiser); Rhine Provinces, more abundant in the south than the north—Trier, Boppard, Bingen, Stolberg, very rare, Cologne, forest near Küppersteg, often abundant (Stollwerck), Bonn (Jordan), Hedwigsruhe, Neuenahr (Maassen), once near Barmen (Weymer); Kingdom of Saxony—Dresden distr., Wachwitz, Loschwitz, Dohna, Heller, Gehege, Lössnitz, Auer, Weinböhle, Meissen (Steinert), Freiberg (Tritzsche), not rare in Upper Lusatia, *e.g.*, Löbau, Eibau, Seifhennersdorf, singly at Rachlau, Mehltheuer, Rothstein, in the plains at Oehna, Kronförstchen, Lieske (Schütze), Chemnitz, rare (Pabst), rather rare near Leipsig, Harth, Beucha (*teste* Gillmer), Hainichen, rare, Frauenstein, Volkenstein, Zschopau, Werdau, Draisdorf, Plauen, Ruppertsgrün, Crimmitschau, Annaberg, abundant, Schneeberg (*Ent. Ver. Iris*); Province of Saxony—Erfurt (Keferstein), Willroda forest, scarce, Neuenberg, Kyffhäuser, Nordhausen (Jordan), Zeitz-on-Elster, gorges between Raabe and Golben (Wilde); Schleswig-Holstein and Hamburg—Eutin, not abundant (Dahl), Bornhört (Boje), between Bergedorf and Reinbeck (Peters), Eppendorf Moor (Zimmermann), very abundant of late years, and also from 1870-1880 in the Sachsenwald, but not seen between 1880 and 1890 (Laplace); Silesia—almost everywhere in the Trebnitz mountains, very scattered elsewhere, Brieg (Döring), Lindewiese and Gräfenberg, singly (Neustadt), Bitke, rare, forest of Haidenwilzen, fairly common (Nohr), near Sprottischwaldau, Muckendorf, Oberleschen, Sagan, rare (Pfitzner); Thuringia—Arnsberg (Henze), one on the Veronikaberg near Martinrode (Gillmer), Gotha, Siebliber Holz, Lauchaer Holz, Boxberg, Hirzberg, in the Schwarze Valley (Knapp), Muhlhausen, not rare, Raddstadt (Jordan); Waldeck, everywhere, but not frequent (Speyer); Württemberg, spread over the whole kingdom, abundant in the Alps—Tübingen, Reutlingen, the Necker, Jaxt and Kocher Valleys (Seyffer), Meran, rare at Stuttgart (Keller and Hoffmann). GREECE:—Parnassus (Brit. Mus. coll.). HELIGOLAND (Gätke). HOLLAND, only in Gelderland;—Arnhem, Mariendaal (Snellen). ITALY, only in the north and centre;—Abruzzi—Roccaraso, Palena (Wheeler) Gran Sasso (Calberla); Campania—foot of Vesuvius (de Selys); Liguria (Curò)—San Remo to Bordighera (Wagner), Madone des Fenêtres (Bromilow); Lombardy (Turati),—Val Bregaglia (Elwes); Piedmont—Mt. Musine (Gianelli), Isella (Wheeler), Varzo, Crevola, Certosa di Pesio, Val Ferret (Lowe), Macugnaga (Bethune-Baker), Susa (Rowland-Brown), Courmayeur, Mont de la Saxe (Tutt), Oulx (Forbes), Val di Vigizzo (Carlini); Tuscany—Boscungo, scarce (Norris), Monte Senario, Monte Morello (Stefanelli), Lucca (Walker). ROMANIA:—Neamtz, Pleschberg, Tschachleu, Slanic, Dulcești, Comanesti, Marcosi (Fleck). RUSSIA:—Baltic Provinces (Nolken)—Riga distr. (Teich); Central Caucasus (Schaposchnikoff); Kaluga (Assmuss); Kasan, not rare (Eversmann); Moscow—Moskaisk, Svenigorod (Assmuss); Orenburg—Spurs of the Urals (Eversmann); Podolia—Bagovitza (Elwes); Pskov (Kusnezoff); St. Petersburg (Sievers) Saratov—Saratov, Sarepta (Eversmann); Simbirsk (Eversmann); Tambov, rather common (Assmuss); Transcaucasia—Borjom, Lagodekhi, Guetchinan (Romanoff); Ufa (Kroulikowski), Viatka, throughout (Kroulikowski); Vilna (Dampf). SPAIN:—Aragon:—widely spread over the higher valleys of the Albarracin district (Mrs. Nicholl), Teruel, Grigos, Camarena (Zapater); Moncayo (Chapman); Leon—Puerto di Pajares (Chapman); New Castile—Tragacete (Chapman), near Cuenca (Mrs. Nicholl). SWEDEN, only singly in the extreme south (Aurivillius)—Skane, Trolle-Ljunby, Gothland (Wallengren). SWITZERLAND, very widely spread in the lowlands and mountains up to 6,000ft. or higher (Frey); widely distributed, but somewhat local, and rarely common (Wheeler);—Berne—between Lauterbrunnen and Wengen (Moss), Grindelwald (Lowe), Kienthal, Kandersteg (Tetley), Engstlen-Alp (Bethune-Baker), Mürren (Wheeler); Geneva (Muschamp)—Versoix (Blachier); Glarus—Glärnisch-Alp (Muschamp); Grisons—Arosa (Jones); Rosegthal (Keynes), Pontresina (Lowe), Languard Fall (Nicholson), Bergün (Wheeler), Preda (Franz), Guarda (Chapman), Sils Maria (Miss Fountaine), Silvaplana (Bethune-Baker), Le Prese (White), Ofen Pass (Tutt), Flims, Churer Rheintal, Tarasp, Sertigthal (Killias), Via Mala (Rowland-Brown), St. Gall—Weesen, Murgthal (Wheeler); Schwyz—Altmatt (Wheeler), Bieberbrücke (Tutt); Ticino—Brugnasco, Piotta, Piottina (Tutt), Roveredo, Reazzino, Fai'do (Wheeler), Fusio (Chapman), Campolungo Pass (Muschamp), San Stefano (Mayer); Unterwalden—Engelberg (Lowe); Uri—Hospenthal, Andermatt (Tutt), Wassen (Keynes); Valais—Vernayaz, Branson, Salquenen, Pfynwald (Alderson); Brig (Sheldon);

Frenières, between Stalden and Saas Fée (Tetley), Trient (Oldaker), Zmutthal (Mrs. Page), Val d'Anniviers (Jones) Vissoye, Fiesch (Pearson), Zermatt (Jordan), Inden, Riffelalp (Bath), Täsch (Rosa), Val d'Hérens (Forbes), Dent du Midi (Muschamp), Bérisal (Prideaux), Steinenthal (Rowland-Brown), Laquinthal, Binn (Keynes), Sierre, Gondo Gorge (Wheeler), Montana (Flemyng), Ferpècle Valley (Tutt) Alpien, Rossbodenalp (Rehfous), Martigny, Arpilles, la Forclaz, Mt. Ravoire, Bovine, Mt. Chemin, Mayens de Sion, Evolène, Visperterbinen, Turtmannthal, Aletsch Forest (Favre); Vaud—Aigle (Gurney), Bex (Murray), Montreux, les Avants (Rowland-Brown), Veytaux, above Luan (Wheeler), Sépey, Rossinières (Tasker), Chateau d'Oex (Tetley), Éclépens (Mrs. Page), Vallée de Joux, Vallorbe, Mt. d'Or, Mt. Tendre (Gibbs). TURKEY:—Therapia (Graves).

NOTE.—Var. *christi* (Rowland-Brown), *Ent. Rec.*, xii., p. 310, is an evident slip for var. *obscura*, Christ.

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### ERRATA.

Page 234, line 4, for "germinated" read "geminated."  
 ,, 251, ,, 26, ,, "Tian-Chian" ,, "Thian-Shan."  
 ,, 247, ,, 18, ,, "Chamouis" ,, "Chamonix."

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NOTE.—Since the re-discovery of *Agriades thersites* by Dr. Chapman, it seems probable that many of the references to *Polyommatus icarus*, ab. *icarinus*, really belong to that species (G.W.).

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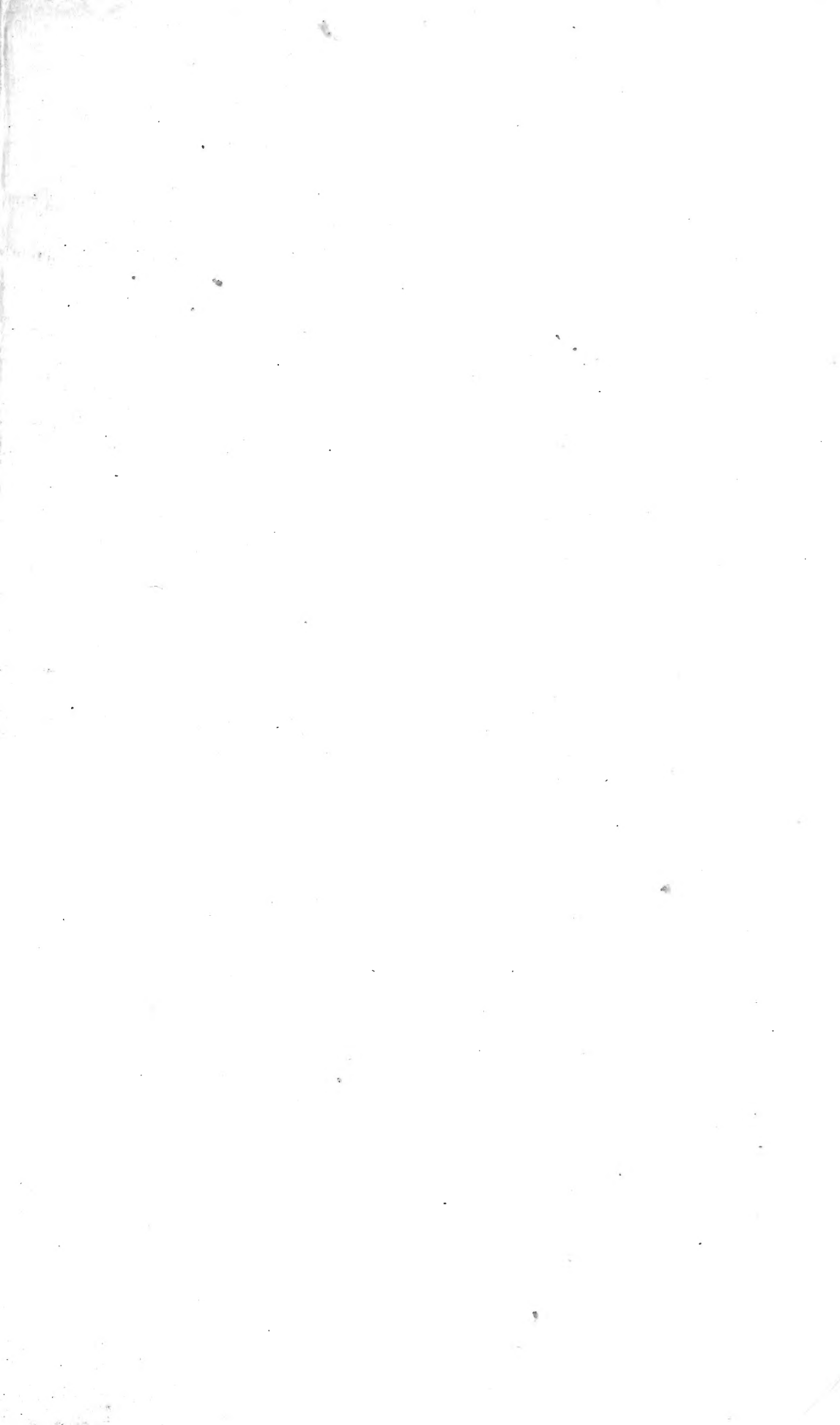












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